2016-2439, -2489

IN THE
UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

ELEVEN ENGINEERING, INC.,
ELEVEN ENGINEERING GAME CONTROL LLC,
Plaintiffs–Appellants,

v.

MICROSOFT CORPORATION,
Defendant-Cross-Appellant.

Appeal from the United States District Court
for the District of Delaware, Case No. 1:09-cv-00903-LPS.
The Honorable Leonard P. Stark, Judge Presiding.

DEFENDANT-CROSS APPELLANT MICROSOFT CORPORATION'S OPENING BRIEF

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November 21, 2016

CERTIFICATE OF INTEREST

Counsel for Defendant-Cross-Appellant Microsoft Corporation certifies the following:

1. The full name of every party I represent is: Microsoft Corporation.
2. The name of the real party in interest (if the party named in the caption is not the real party in interest) I represent is: N/A
3. All parent corporations of the party I represent are: N/A
4. All publicly held companies that own 10 percent or more of the stock of the party I represent are: N/A.
5. The names of all law firms and the partners or associates that appeared for the party now represented by me in the agency or are expected to appear in this court are:

   Fish & Richardson P.C.: John W. Thornburgh, Proshanto Mukherji, Gregory R. Booker, Elizabeth M. Flanagan, Christopher A. Winter, Tamara Fraizer (no longer with firm), Tara D. Elliott, Warren K. Mabey, Jr. (no longer with firm), and W. Chad Shear.

   Microsoft Corporation: Isabella Fu

Dated: November 21, 2016

/s/ John W. Thornburgh
John W. Thornburgh

TABLE OF CONTENTS

TABLE OF AUTHORITIES

Page(s)

Cases

Statutes

Other Authorities

STATEMENT OF RELATED CASES

Counsel for Microsoft Corporation states as follows:

1. There has been no previous appeal in this case;

2. No other cases are pending between the same parties; and

3. Counsel is not aware of any known or pending case that will directly affect or be directly affected by the Court's decision in this appeal.

STATEMENT OF JURISDICTION

The district court had original jurisdiction under 28 U.S.C. §§ 1331, 1338(a). The district court issued a claim construction order on June 23, 2016 and an amended claim construction order on July 12, 2016. The district court also entered a Final Judgment and Order on June 23, 2016, which entered final judgment against Eleven Engineering, Inc. and Eleven Engineering Game Control LLC (collectively "Eleven") on their claim that Microsoft infringes U.S. Patent No. 6,684,062 ("the '062 patent") and against Microsoft on its affirmative defense that the asserted claims of the '062 patent are invalid as indefinite under 35 U.S.C. § 112(b). Appx1–6. Eleven filed a timely notice of appeal on August 9, 2016 (No. 2016-2439), Appx948–949, and Microsoft filed a timely notice of cross-appeal on August 15, 2016 (No. 2016-2489). Appx950–951. Microsoft's cross-appeal is proper because a judgment of invalidity would broaden its rights compared to the judgment of noninfringement. *See Radio Sys. Corp. v. Lalor*, 709 F.3d 1124, 1132 (Fed. Cir. 2013). This court has jurisdiction under 28 U.S.C. § 1295(a).

STATEMENT OF THE ISSUES

Eleven's Appeal

1. Did the district court correctly construe the term "save power by turning off" radio transceivers to require actually *turning off* the transceivers—*i.e.* achieving "a state of no power"—rather than simply "lowering power consumption" by any means?

Microsoft's Cross-Appeal

2. Did the district court err when it held that system performance requirements that are expressly set forth in the body of the claim, that the applicant relied on to distinguish prior art during prosecution, and that reflect constraints that are not captured by any other language in the claims are not claim limitations?

3. Did the district court err by not holding that these performance limitations are indefinite where they lack objective boundaries and depend upon subjective perceptions?

INTRODUCTION

Eleven's position rests on rewriting clear claim language—"sav[ing] power by turning *off*"—into something else entirely, namely merely reducing or turning *down* the power by any method. Such a significant rewrite of the claims could only be justified if there were an unambiguous definition of the "turning off" term in the specification or prosecution history. However, there is none. In fact, the intrinsic evidence is entirely consistent with the district court's conclusion that turn off literally means turn off. As detailed herein, Eleven's citations to the specification are directed to reducing power levels *during transmission*; they are not relevant to the claim language at issue, which specifies what happens when the transceivers are neither transmitting nor receiving. The district court's construction of "turning off" and resulting judgment of noninfringement (which is undisputed apart from claim construction) is thus correct and should be affirmed.

On the cross-appeal, this Court should also hold that expressly claimed performance limitations, relied upon during prosecution, are claim limitations. And since these limitations lack objective boundaries and depend upon subjective perceptions (*e.g.*, of what constitutes a "small" delay), the asserted claims are indefinite. This Court should reverse the contrary conclusion reached by the district court.

STATEMENT OF THE CASE

A. THE PARTIES

Microsoft Corporation ("Microsoft") is a world leader in computer software and hardware technology. Among these is its successful Xbox line of computer gaming consoles, peripherals, games, and software.

Eleven Engineering, Inc. ("EEI") is a Canadian startup that tried but failed to build commercially successful wireless game controllers in the late 1990s and early 2000s. Appx925; Appx1093. Between 2000 and 2003, EEI tried to build a wireless game controller system that would be compatible with Microsoft's original Xbox system. Appx925. In the course of doing so, it reached out to Microsoft to ask for help understanding how the Xbox worked. Microsoft provided this help, but EEI was nevertheless unable to bring a product to market. *See* Appx925. EEI was also unsuccessful at developing products that worked with other game consoles, such as Sony's and Nintendo's, and exited the game controller market soon thereafter. Appx922.

Eleven Engineering Game Control LLC is a non-practicing entity that was set up in 2011 to monetize some of EEI's game-controller patents. *Id.* It makes no products and has no business other than patent litigation. *Id.*

In this brief, Microsoft will refer to both Appellants collectively as "Eleven."

B. THE '062 PATENT AND PROSECUTION HISTORY

The '062 patent's specification focuses on the technology claimed in the patent's original claims (filed October 2000), which are very different from what the patent now claims. The main idea, as expressed in the original claims, abstract, and specification, was to have wireless game controllers transmit their differing operating characteristics to a game console (i.e. the "base transceiver") so that the console would know how to interpret signals it received from the controllers. *See, e.g.*, Appx556 (original abstract):

> A radio frequency wireless system … comprises a base transceiver engaged with the game device, a controller for transmitting RF wireless signals to the base transceiver, and a microprocessor engaged with the base transceiver for controlling the receipt and transmission of said RF wireless signals. The microprocessor is capable of identifying the selected operating characteristics of the controller and of modifying operation in response to said operating characteristics.

See also Appx552 (original claim 1). The "Summary of the Invention" section of the '062 patent describes the invention the same way. Appx21–37 at 2:49–61.

But this concept turned out not to be novel. On October 3, 2002, the Examiner rejected all the pending claims over prior art. *See* Appx455. In response, on February 2, 2003, Eleven admitted that "the claims as previously submitted … gave the appearance that there was no inventive step" over the prior art. Appx581. It re-characterized the purported invention as being "a variety of techniques to achieve significant advantages in the areas of latency, reliability, power consumption, and cross platform compatibility." Appx558. It deleted its abstract and abandoned the original claims, and

substituted new claims made up of different combinations of a grab-bag of conventional technical features: some game-controller features (*e.g.*, force-feedback mechanisms), some wireless features (*e.g.*, various channel monitoring and adaptation techniques), and some power-saving features. Appx566–568. Some of these newly added features are disclosed in various embodiments in the patent, but others—such as the power-down features discussed below—appear nowhere in the specification.

Two of the changes Eleven made to its claims are relevant to this appeal. First, among the power-saving limitations Eleven added was the requirement that the devices could "power *down* the radio transceivers … in the controllers for periods of time in order to extend battery life in the controllers" and likewise "power *down* the radio transceiver … in the base transceiver device for periods of time in order to reduce power consumption." Appx568 (emphasis added).

Second, the new claims required that the system must "achiev[e] a small system latency with a small standard deviation" that is not "perceived as control lag by the user." *Id.* Eleven argued that these performance requirements were distinguishing features of the invention because the prior art "did not describe a means for achieving *low latency* …," among other things. Appx582 (emphasis added). The claims also specified what the latency requirements meant, explaining that "the mean of the system latency is significantly smaller than the mean of the latency introduced by the electronic game device itself (electronic game devices typically introduce latencies of 8.3mS to

16.7mS as a consequence of their polling -- the control system latency must be small in comparison in order to not be perceived as control lag by the user) …" Appx568.

What happened next is murky because Eleven did not comply with its prosecution obligations. The Examiner did not allow the changed claims but instead initiated an interview with Eleven to discuss the application. Appx594. We do not know what was said at the interview because Eleven failed in its legal obligation to record the interview in writing. "The applicant must provide … a written record of the substance of any such meeting or discussion for inclusion in the application file wrapper," *Litton Sys., Inc. v. Whirlpool Corp.*, 728 F.2d 1423, 1439 (Fed. Cir. 1984); *see also* M.P.E.P. § 713.04; 37 C.F.R § 1.2, but Eleven failed to do so.

We do know, however, that Eleven made several changes to the claims in response to the interview. Eleven filed a "Supplemental Amendment" on April 14, 2003 that changed the claim language. Appx585–594. Eleven confirmed that all these changes were made "pursuant to [the] examiner initiated telephone interview" and argued that the claims application should be allowed in part "[i]n view of the revised new claims." Appx594. One of the amendments Eleven made at the Examiner's behest was to change the "power *down*" limitation to recite "turning *off*" instead—specifically, that "the controllers [and the base transceiver] can use the synchronous time domain multiplexing to save power by *turning off* their radio transceivers when they are not receiving or transmitting data." Appx587. Another was to revise the performance-requirements limitation, removing the specific numbers from the claim and changing

the wording to "achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag." *Id.*

The Examiner then allowed the claims without any further rejections. Appx600–603. In his Notice of Allowability, he listed both the "turning off" limitation and the performance requirements—along with many others—as elements that "ha[d] not been disclosed, taught, or made obvious over the prior art of record." Appx601–602.

C. THE DISTRICT COURT PROCEEDINGS

1. Overview

Eleven sued Microsoft, Sony, and Nintendo in November 2009. Appx48. It alleged that certain of the Defendants' wireless gaming products—in Microsoft's case, the Xbox 360 game system—infringe the '062 patent as well as two other Eleven patents (U.S. Patent Nos. 6,238,289 ("the '289 patent") and 6,346,047 ("the '047 patent")). Microsoft asserted as an affirmative defense that the asserted claims of the '062 patent are invalid as indefinite. Appx139–140.

The '289 and '047 patents are no longer in the case. Eleven dropped its allegations of infringement under the '289 patent following an adverse ruling by the Patent Office in a reexamination proceeding, and the parties settled their disputes with regard to the '047 patent. Appx933–934. Eleven also settled with Sony and Nintendo.

2. Claim Construction

a) "Saving power by turning off"

(1) The dispute between the parties

The claims say that the wireless game controllers and the base transceiver can "save power by turning off their radio transceivers when they are not receiving or transmitting data." Appx35, 14:31–37. Eleven contended that to "save power by turning off" meant only "to lower power consumption," no matter how that is done. Appx13. By contrast, Microsoft argued that "turning off" means precisely that, and that the claim requires actually turning off the radio transceivers when they are not sending or receiving. *Id.*; Appx514–516.

Neither Microsoft nor the district court changed its interpretation of "turn off" during claim construction as Eleven now asserts. Appellant Br. 20–21. Eleven's assertion that it did not understand Microsoft to be asserting that it meant completely turning off so as to achieve a state of no power is incorrect, as the following quotations from its own briefs to the district court make plain:

> "Microsoft's construction [is] that the component has to be completely shut off …" Appx470 (Eleven Op. *Markman* Br. at 5).

> "[Microsoft] claims that 'sav[ing] power by turning off … radio transceivers' must necessarily result in eliminating all power in the circuitry." Appx882 (Eleven Resp. *Markman* Br. at 3).

To confirm the ordinary meaning of "turn off" to a person of skill in the art, Microsoft also submitted a dictionary definition to the district court. This definition confirmed that turning *off* an electronic device means to actually "shut [it] off" and to

"stop the … flow of" electrical power, and that, by contrast, turning *down* the device requires only "diminish[ing] the … flow" of power." Appx629. This is consistent with the meaning of "turn off" to one of skill in the art, the intrinsic record, and the district court's claim construction. However, Microsoft's dictionary definition was never itself proposed as an alternative construction by either party.

(2) The district court's construction

The district court agreed with Microsoft that "turn off" means precisely that, rather than merely lower power consumption. It rejected Eleven's attempt to rewrite the claim language. Appx13–14. It gave three reasons. First, the district court held that Eleven's proposal—that "saving power *by turning off*" encompasses "lowering power consumption" by any method—would read "turning off" out of the claims, and that this would be incorrect because "[a] Court's construction must give meaning to all the words in the claims." Appx13 (citation and alterations omitted).

Second, the district court found that the prosecution history confirms that the ordinary meaning of "turning off" applies because the patentee knew how to claim turning the power *down* but affirmatively deleted that requirement and changed it to turning *off*. Appx14. Specifically, the district court noted that, "during prosecution of the '062 patent, the patentee amended the claim from 'power down' to 'turn off,'" *id.*; *see also* Section B above, and concluded that "[w]hereas 'power down' might imply one or more interim settings between 'on' and 'off,' 'tum off' more strongly connotes a state of no power." *Id.*

Third, the district court found that "the record is devoid of intrinsic evidence to support the view that a person of ordinary skill in the art would have understood the claims to be using the words "sav[ing] power by *turning off*' to include methods of saving power other than simply shutting it off." *Id.* (emphasis in original).

Accordingly, the district court adopted Microsoft's proposal that turning off actually means "turning off," rather than merely "lowering power consumption." Appx14.

(3) The district court amended its construction at the parties' request

After the district court construed "turn off" literally to mean "turn off," as Microsoft had requested, Eleven contemplated pressing ahead with an expert report that would say that the "turn off" element could be met by merely lowering power consumption, and that Microsoft's accused products infringed on that basis. However, Eleven realized that this argument would not survive summary judgment given the district court's conclusion in its claim construction *opinion* that "turn off" implies a "state of no power." Appx14.

Accordingly, to streamline the case, the parties jointly requested that the district court amend its claim construction order to explicitly include the language from its opinion, to make it absolutely clear that the court had rejected Eleven's argument that "turn off" means "lowering power consumption." Appx3-4. The district court granted this request. Appx6–7. On that basis, Eleven conceded that the accused Microsoft

products do not infringe. Appx4. The court entered a final judgment of noninfringement on July 11, 2016. Appx1–5.

b) The performance requirements of latency, standard deviation, and user-perceived control lag.

Claim 1, from which all asserted claims depend, says that "the frequency hopping and synchronous time domain multiplexing techniques are used in conjunction with one another to help ensure that packets are received intact on the first attempt thus circumventing the need to retransmit damaged packets and thereby *achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag.*" Appx35 at 14:23–30 (emphasis added). Microsoft argued that this claim language is part of the claim, and that the terms of degree "a small system latency," "a small standard deviation," and "minimizing the user's perceived control lag" lack objective boundaries for those of skill in the art and are therefore indefinite. Appx739–744; Appx521–523. It argued that the prosecution history, in which these performance requirements were added in response to a rejection, relied upon to distinguish prior art, substantively amended in response to an Examiner interview, and cited as a reason for allowance, showed that they were operative claim limitations. Appx739–741; *see also* Section B above. It also provided undisputed evidence, including in the form of an expert declaration, Appx746–758, that these performance requirements reflect substantive constraints that are not captured elsewhere in the claims and are not merely

the result of arranging the components of the claims in the manner recited. Appx756-757 ¶¶ 60–64.

Eleven argued that since these limitations are preceded in the claims by the word "thereby," they do not form part of the claim and should not be construed. Appx474–475. In the alternative, Eleven argued that they should be construed collectively as "achieving consistently small system delay that enables real time wireless video game performance." Appx475–477.

The district court agreed with Eleven that this claim language was not part of the claim. It reasoned that the phrase only "describes the result of using frequency hopping and synchronous time domain multiplexing techniques … in conjunction with one another to help ensure that packets are received intact on the first attempt," and that "[s]uch laudatory language describes the value of the claimed invention, but does not impose structural limitations." Appx18. As a result, the district court held "that the claim term has not been proven indefinite." *Id.* The district also adopted Eleven's alternative proposed construction. *See id.*

Based on this finding, the district court entered final judgment against Microsoft on its defense that the asserted claims are invalid as indefinite. Appx1–5.

SUMMARY OF ARGUMENT

A. THE DISTRICT COURT CORRECTLY CONSTRUED "SAVE POWER BY TURNING OFF"

The district court correctly construed "save power by turning off" the radio transceivers to require actually turning off the transceivers—*i.e.* achieving "a state of no power"—and not as covering any and all ways of "lowering power consumption." First, this interpretation follows from the claim language and the ordinary meaning of the term. Eleven's proposal reads "turning off" out of the claim and conflates turning *off* with turning *down*. The dictionary that Microsoft cited to the district court (and upon which Eleven now relies) confirms that turning *off* an electronic device means to actually "shut [it] off" and to "stop the … flow of" electrical power and that, by contrast, turning *down* the device requires only "diminish[ing] the … flow" of power." Appx629.

Second, the prosecution history confirms that "turning off" means turning the power off rather than merely turning it down. Eleven originally tried to claim "power[ing] *down*" the device but had to expressly delete that language and substitute "turning off" as a result of an Examiner interview. Appx568; Appx586–594. Here, as the district court found, "[w]hereas 'power down' might imply one or more interim settings between 'on' and 'off,' 'tum off' more strongly connotes a state of no power." Appx14. The district court rightly declined to allow Eleven to undo its change of language during prosecution via claim construction. *Id.*

Eleven's many arguments for reversing its choice of claim language are meritless. "Down" and "off" plainly mean different things and Eleven has provided no evidence that a skilled artisan would treat them as the "same concept." *See* Appellant Br. 49, 51; *see also id.* 31–33. Similarly, Eleven's assertion that its reasons for making the change during prosecution are too "ambiguous" to constitute a disavowal of claim scope are misplaced. First, this is not a disavowal case. The district court did not find that Eleven had *disavowed* part of the ordinary meaning, nor did it need to find any disavowal; instead, the court properly read the claim in light of the prosecution history to confirm that the ordinary meaning of "off" was intended. Second, Eleven's reasons for changing the language are legally irrelevant in light of the fact that the change was actually made. *See, e.g.*, *Laryngeal Mask Co. v. Ambu*, 618 F.3d 1367, 1373 (Fed. Cir. 2010). And finally, the prosecution history shows that the amendments *were* made for substantive reasons—in response to an Examiner interview—and Eleven is estopped from arguing otherwise because it failed in its legal duty to memorialize the interview. *See Litton Sys., Inc. v. Whirlpool Corp.*, 728 F.2d 1423, 1439 (Fed. Cir. 1984).

Third, the district court also correctly held that "[t]here is no support in the specification for Eleven's contention." Appx14. The specification never mentions "turning off" or any variant of that phrase, nor does it disclose what happens to the radio transceivers at the time specified in the claim—i.e. "when they are not receiving or transmitting data." Appx35 at 14:31–37. Eleven's new argument on appeal that because the transceivers can use different levels of transmission power when they *are*

transmitting, that somehow means that they need not be turned off when they are *not* transmitting, Appellant's Br. 34–35, 37–38, is both waived and plainly incorrect.

Finally, equally waived and meritless is the "alternative" construction Eleven proposes for the first time on appeal ("stopping the operation, activity, or flow of"), Appellant Br. 30, which is based on a misreading of the dictionary definition cited by Microsoft. "[P]resenting proposed claim constructions which alter claim scope for the first time on appeal invokes the doctrine of waiver as to the new claim constructions," *NTP, Inc. v. Research In Motion, Ltd.*, 418 F.3d 1282, 1296 (Fed. Cir. 2005), which is exactly what Eleven is seeking to do here. In any case, the dictionary definition supports the district court's construction. Eleven proposes a strained misreading of the definition under which the mere fact that radio transceivers are not transmitting or receiving data *itself* constitutes turning them off, which would render superfluous the claim's requirement of "sav[ing] power *by turning off* the[] radio transceivers *when they are not receiving or transmitting data*."

This Court should therefore affirm the district court's construction and the judgment of noninfringement that follows from it.

B. THE SYSTEM PERFORMANCE REQUIREMENTS LISTED IN THE CLAIMS ARE SUBSTANTIVE LIMITATIONS AND MAKE THE CLAIMS INDEFINITE.

The district court erred by holding that the performance requirements expressly set out in the claims are meaningless "laudatory language" that is not part of the claimed invention and that therefore does not render the claims indefinite. Appx18. The claims

expressly recite a wireless system that "achiev[es] a small system latency with a small standard deviation and therefore minimiz[es] the user's perceived control lag." Appx35 14:27–30. Moreover, the prosecution history shows that these performance requirements are a substantive part of the claims, because they were added to the claim in response to a rejection, Appx568; Eleven argued that they distinguished the invention from the prior art, Appx582; Appx594; the Examiner required substantive changes to them before allowing the claims, Appx587; Appx594; and the Examiner listed them among the distinguishing features of the invention in the Notice of Allowance, Appx600–603. Furthermore, there is undisputed evidence that these performance requirements reflect substantive constraints that are not captured elsewhere in the claims and are not merely the result of arranging the components of the claims in the manner recited. Appx756-757 (Microsoft expert declaration) ¶¶ 60–64. The district court erred by reading these limitations out of the claims.

Further, although these performance requirements are an important part of the claim, they do not have a clearly defined scope. Without "objective boundaries for those of skill in the art," such terms of degree are indefinite. *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1370–71 (Fed. Cir. 2014). Here, the patent and prosecution history provide no objective standard to determine whether the system latency or its standard deviation are "small" enough, or whether the "user's perceived control lag" is sufficiently "minimized" to fall within the claim. The "user's perceived control lag" also varies radically from user to user, game to game, network to network, and screen

to screen. Appx755–56 (Microsoft expert declaration) ¶¶ 51–58. Thus, the claim "requires that an artisan make a separate infringement determination for every set of circumstances in which the [game system] may be used" and, as a result, is the "epitome of indefiniteness." *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1254 (Fed. Cir. 2008).

Finally, while the district court adopted a construction for these requirements, that construction is wrong as a matter of law and is itself indefinite, at least as Eleven interprets it. The district court rewrote the claim language and reduced the three specific performance metrics in the claim to the undefined concept of "real time video game performance." Appx18. Furthermore, the parties disputed what "real time" means—a dispute the district court did not resolve—and under Eleven's interpretation ("the user of the game system will not be able to perceive any delay during game play," Appx476), the district court's construction is itself indefinite. Read that way, infringement again turns on users' *perceptions* of delay, which are subjective and mutable.

Accordingly, the Court should reverse the judgment of no indefiniteness, or at least vacate it so that the district court can clarify its construction and consider whether it too is indefinite.

ARGUMENT

A. STANDARD OF REVIEW

Eleven's Appeal—Microsoft agrees with Eleven that the district court's claim construction is reviewed *de novo* to the extent it is based on intrinsic evidence while any subsidiary factual findings based on extrinsic evidence are reviewed for clear error. *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 840–41 (2015). Additionally, because the "decision as to the need for and use of expert[testimony] is within the sound discretion of the district court," Eleven's argument that the district court erred by declining to consider certain expert testimony is reviewed for abuse of discretion. *Inpro II Licensing, S.A.R.L. v. T-Mobile USA, Inc.*, 450 F.3d 1350, 1357 (Fed. Cir. 2006).

Microsoft's Cross-Appeal—The district court's conclusion that claim 1's express performance requirements are not indefinite is also reviewed *de novo*. "Indefiniteness is a question of law that this court reviews *de novo*." *Dow Chem. Co. v. Nova Chemicals Corp. (Canada)*, 803 F.3d 620, 625 (Fed. Cir. 2015), *cert. denied*, 136 S. Ct. 2452 (2016). While any subsidiary factual findings based on the extrinsic record would again be reviewed for clear error, *UltimatePointer, L.L.C. v. Nintendo Co.*, 816 F.3d 816, 826 (Fed. Cir. 2016), the district court made no such subsidiary findings here, but rather construed these requirements in light of the intrinsic record as mere "laudatory language" that is not part of the claimed invention. Appx18.

B. THE DISTRICT COURT CORRECTLY CONSTRUED "SAVE POWER BY TURNING OFF."

The district court correctly construed "save power by turning off" in accordance with its ordinary meaning to one of skill in the art, the surrounding claim language, the prosecution history, and the other evidence. As it expressly found, "the record is devoid of intrinsic evidence to support the view that a person of ordinary skill in the art would have understood the claims to be using the words "sav[ing] power by *turning off*" to include methods of saving power other than simply shutting it off." Appx14 (emphasis in original). Eleven's proposed construction—"lowering power construction"— reads "turning off" out of the claim, expands the term "turning *off*" to encompass simply "turning *down*," and is inconsistent with the prosecution history and extrinsic evidence. Eleven also proposes a new "alternative" construction for the first time on appeal, which is both waived and wrong on the merits. This court should affirm the district court's construction and the judgment of noninfringement that follows from it.

1. "Turning *off*" requires stopping the flow of power, not merely turning it *down*.

The district court's construction properly captures the ordinary meaning of "save power by turning off," both in the context of the claims and in ordinary usage in the art.

The language of the claims is express, clear, and dispositive. It specifies both a goal (to "save power") and how that goal is to be achieved ("by turning off [the] radio transceivers when … not receiving or transmitting data"). Eleven's construction, which

reduces that entire phrase to "lower[ing] power consumption," reads the specified method of achieving the goal out of the claim. That is wrong. As the district court held, "[a] Court's construction must give meaning to all the words in the claims." Appx13 (*quoting Funai Elec. Co. v. Daewoo Elecs. Corp.*, 616 F.3d 1357, 1372 (Fed. Cir. 2010)) (internal alterations omitted). Express requirements cannot be deleted via claim construction. *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 950 (Fed. Cir. 2006). So in the context of these particular claims, "turning off" cannot mean merely "lower[ing] power consumption."[1]

The same is true of the meaning of "turning *off*" to a person of ordinary skill in the art. Eleven's proposed construction broadens turning *off* to include turning *down*. For instance, an electric light with multiple power levels (from zero power to maximum power) is turned *down* whenever power is lowered, but turned *off* only when it is lowered all the way to zero.[2]

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[1] As Microsoft's expert also explained: "A skilled artisan would understand that while "lowering power consumption" is akin to the goal of saving power, it does not by itself include the claimed technique for achieving that goal, and therefore does not reflect the full scope of the claim." Appx750 ¶ 17.

[2] Eleven presents no evidence to support its argument that "turning off" television circuitry means lowering its power consumption rather than shutting off its power—and there is none. Appellant Br. 39. Eleven has provided neither technical references, nor dictionary definitions, nor even expert testimony to support this allegation. Eleven is simply wrong. A television that is turned off may remain plugged into a wall outlet as Eleven says, *id.*, but that does not mean that it is not off. On the contrary, this analogy also just points out the absurdity of Eleven's construction. One

A dictionary Microsoft cited to the district court supports Microsoft, not Eleven. *See* Appx516 (excerpt from Webster's New Collegiate Dictionary (1999)). It confirms that to turn *off* an electronic device means to actually "shut [it] off" and to "stop the … flow of" electrical power, while by contrast to turn it *down* only requires "diminish[ing] the … flow" of power:[3]

"Turn Off"	**"Turn Down"**
"to *stop* the operation, activity, or flow of : SHUT OFF" (Appx629.)	"to *diminish* the speed, volume, intensity, or flow of" (*Id.*)

Eleven presents no evidence to this court, nor did it present any to the district court, that the ordinary meaning of "turning off" is merely "lowering power consumption." *See generally* Appellant's Br.; Appx467–470; Appx882–884 (Eleven's district court arguments). Certainly, the definition of "turn off" quoted above does not say that.

Eleven creatively excerpts and misreads the dictionary to argue that it supports Eleven's construction. Appellant Br. 29–30. Eleven ignores the part of the definition that applies to the "flow" of electrical power and misreads the remainder— "to stop the operation [or] activity … of"—in such a way as to render "turning off" meaningless in the context of the claim. *Id.* Its position, as it told the district court, is that

could "lower [a television's] power consumption" by reducing its volume or screen brightness, but that plainly does not "turn off" the television.

[3] The same dictionary gives an example of "turn on" as to "turn on the light bulb." Appx629. "Turn off" similarly, is used in the same sense as "turn off the light bulb," which means flipping the switch and stopping the flow of power to the bulb.

"[w]hen[ever] the radio transceiver is neither transmitting nor receiving data … its operation [or] activity … is stopped" and so it is by definition "turn[ed] off." Appx833; *see also* Appellant Br. 29–30. In other words, the very fact that the radio transceivers are not transmitting or receiving means they are "turned off."

Eleven's creative reading again reads "turning off" out of the claims. The claims say that the devices "turn[] off their radio transceivers *when they are not receiving or transmitting data.*" If not receiving or transmitting data *itself* counts as being turned off, as Eleven proposes, then the claim would circularly require "turning off their radio transceivers *when they are turned off,*" and the claim language "turning off" would be meaningless and unnecessary. Eleven's interpretation of the "operation [or] activity" language thus fails as a matter of law. *Funai*, 616 F.3d at 1372.

In reality, the "operation [or] activity" language in Microsoft's dictionary is perfectly consistent with the district court's construction. Electronic devices like radio transceivers "operate" and "act" when and only when electrical power is "flowing" into them, so that stopping the "flow" of power to these devices is the same as stopping their "operation [or] activity."[4]

* * *

[4] This does not render the phrases "operation" and "activity" redundant. The general-purpose dictionary definition at issue here is not limited to electrical devices, and in other contexts the "operation" and "activity" of a device may indeed be distinct from the "flow" of electrical power. For example, "turning off" a gas oven or a lawnmower usually does not involve electrical power.

In short, the district court's construction accords with the plain meaning of the phrase at issue both in the context of claims and to a person of ordinary skill in the art, whereas Eleven's proposal reads out the key language and conflates turning *off* with turning *down*.

2. The prosecution history confirms that the claims require actual turning *off*, and not merely turning the power *down*.

a) Eleven knew how to claim "power down" but changed that language in response to an Examiner interview.

The district court was also correct that the prosecution history confirms the need for actual turning *off*, not just turning the power down. Appx14. "[T]he prosecution history may be given substantial weight in construing a term where that term was added by amendment." *Bd. of Regents of the Univ. of Texas Sys. v. BENQ Am. Corp.*, 533 F.3d 1362, 1369 (Fed. Cir. 2008). Here, Eleven expressly changed the "power[ing] down" language (A568) to "turning off" as a result of an Examiner interview. Appx586–594.

The relevant prosecution history is as follows. On October 3, 2002, the Examiner rejected all the pending claims over prior art. *See* Appx455. Eleven then amended the claims to add the limitation that the devices can "power down the radio transceivers." *See* Appx449 (Feb. 3, 2003 Am. at 12). However, the Examiner did not allow the claims with this language but instead held an interview with Eleven. Appx594. While we do not know what was said at the interview because Eleven failed in its legal obligation to record the interview in writing, *see* pp. 5-8 above, we do know that Eleven made a number of changes to the claims in response to it. Appx586-594. One of these was to

delete the "power down" limitation and substitute "turning off the[] radio transceivers." Appx586–587. Eleven confirmed in writing that all these changes were made "pursuant to [the] examiner initiated telephone interview" and argued that the Examiner should allow the application in part "[i]n view of the revised new claims":

> "These new claims are being filed *pursuant to an examiner initiated telephone interview* with Mr. Marceau Milord on April 9, 2003.
>
> *In view of the revised new claims* and the arguments presented in the Amendment of February 3, 2003, it is respectfully submitted that this Application is in condition for allowance and allowance is respectfully requested."

Appx594 (emphasis added). The Examiner then allowed the claims, Appx600–603, citing the "turning off" language as part of his reason for doing so. Appx602.

This prosecution history confirms that "turning off" means what it says: actually shutting the power off rather than merely turning it down. Appx14. "Different claim terms are presumed to have different meanings." *Regents,* 533 F.3d at 1371 (citation omitted). Here, as the district court found, "[w]hereas 'power down' might imply one or more interim settings between 'on' and 'off,' 'tum off' more strongly connotes a state of no power." Appx14. In short, Eleven knew how to claim "power down" but affirmatively amended the claim language to encompass only "turning off."

b) Eleven's challenges to the district court's analysis of the prosecution history are meritless.

Eleven puts forward a grab-bag of disparate arguments challenging the district court's analysis of the prosecution history. All are meritless.

(1) The change from "power down" to "turning off" was not meaningless.

Eleven first asserts that the change from "power down" to "turn off" was meaningless; that the two are really "the same concept"; and that the district court's analysis relies on its own idiosyncratic "personal and subjective beliefs" rather than those of a skilled artisan. Appellant Br. 49,51; *see also id.* 31–33. That is facially incorrect. First, "down" and "off" are words with ordinary meanings in the electrical art, which the district court correctly applied. As we have discussed, one can turn "down" a light without turning it "off," and dictionaries confirm this distinction. *See* Section 1 above.

Second, Eleven provides *no* evidence—in its brief to this court or in the proceedings below—that a person of skill in the art would read "power down" differently. *See, e.g.,* Appellant Br. 44–51. It has cited neither dictionary definitions, nor prior art, nor even after-the-fact expert testimony about the meaning of "power down" to support its accusation that the district court applied a "personal and subjective" interpretation of the term. *See, e.g.*, *id.*[5]

Third, Eleven offers no legally sufficient explanation for the change in this key claim language. "Different claim terms are presumed to have different meanings." *Regents,* 533 F.3d at 1371 (citation omitted); *see also SimpleAir, Inc. v. Sony Ericsson Mobile*

[5] Eleven's sole argument is the waived and meritless assertion—which we address in Section B.3 below—that because the devices can use different levels of transmission power when they *are* transmitting, that somehow means that they need not be turned off when they are *not* transmitting. *Id.*

Commc'ns AB, 820 F.3d 419, 431 (Fed. Cir. 2016) (amendment that used "data channel" rather than "data feed" supported conclusion that the two terms have different meanings). Eleven provides nothing to overcome this presumption save its unsupported assertion that they "capture the same concept *albeit* in slightly different wording." Appellant Br. 49.

(2) The change from "power down" to "turning off" is not irrelevant.

Eleven's next argues that even if "power down" is broader than "turn off," it is entitled to recapture the full scope of "power down" via claim construction because the prosecution history is allegedly too "ambiguous" to constitute a disavowal of claim scope. Appellant's Br. 44–51. This argument misinterprets the district court's decision and is legally wrong.

To begin with, this argument is a red herring because the district court did not find that Eleven had *disavowed* part of the ordinary meaning of "turn off." Rather, the court properly read the claims in light of the prosecution history to confirm that the ordinary meaning was intended. *See* Appx14. "The prosecution history may offer interpretative assistance to the court in construing a particular claim" even where it does not "take the form of an express disclaimer." *Prima Tek II, L.L.C. v. Polypap, S.A.R.L.*, 318 F.3d 1143, 1149 (Fed. Cir. 2003). Thus, "[a]ny explanation, elaboration, or qualification presented by the inventor during patent examination is relevant [to] claim construction …." *Fenner Investments, Ltd. v. Cellco Partnership*, 778 F.3d 1320, 1323 (Fed.

Cir. 2015). Here, the district court found that because Eleven knew how to claim "power down" but affirmatively narrowed it to "turning off" in light of an Examiner interview, this confirms that the two do not mean the same thing. *See* Appx14. This finding involves no ambiguity and is plainly correct.

Moreover, Eleven *did* unambiguously surrender the claim scope between "power down" and "turn[] off," and Eleven is estopped from arguing otherwise. Eleven argues that it is impossible to tell whether the amendment was made "for patentability reasons" because other amendments were made at the same time and because Eleven failed to record the interview. Appellant Br. 50–51. That argument is wrong on the law and on the facts.

First, as a matter of law, it does not matter whether Eleven made the amendments for "patentability reasons" or not. "Regardless of why [the patentee] amended its claims, … it would be improper to read a [deleted] limitation back in[] …." *Laryngeal Mask Co. v. Ambu*, 618 F.3d 1367, 1373 (Fed. Cir. 2010) (improper to give amended claim same scope as original claim even though amendment had nothing to do with patentability). Thus, for example, even "claims that were deliberately limited [merely] in order to expedite prosecution … cannot regain that scope for infringement purposes." *Biogen, Inc. v. Berlex Labs., Inc.*, 318 F.3d 1132, 1142 (Fed. Cir. 2003); *see also Texas Instruments Inc. v. U.S. Int'l Trade Comm'n,* 871 F.2d 1054, 1065 (Fed. Cir. 1989); *Kistler Instrumente AG v. United States,* 628 F.2d 1303, 1308 (Ct.Cl.1980). Eleven cannot undo its amendment via claim construction, no matter why it made it.

Second, as matter of fact, the prosecution history shows that *all* the amendments were made for substantive reasons. As we have discussed, all the amendments were expressly made "pursuant to [the] examiner initiated telephone interview" and the entirety of the "revised new claims" was urged as a reason for patentability. *See* Section a) above. These statements in the prosecution record contradict Eleven's speculation that some subset of these revisions may not have been made for substantive reasons after all. *See* Appellant's Br. 46–48.

Third, Eleven is also estopped from offering such speculations because, even if any residual ambiguity could be thought to exist, it is the result of Eleven's own failure to memorialize the interview in writing as it was legally obligated to do. "It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file …." M.P.E.P. § 713.04[6]; 37 C.F.R § 1.2. Thus, "[t]he applicant must provide … a written record of the substance of any such meeting or discussion for inclusion in the application file wrapper." *Litton Sys., Inc. v. Whirlpool Corp.*, 728 F.2d 1423, 1439 (Fed. Cir. 1984). Eleven undisputedly failed to do this. Accordingly, "[a]s a result of [Eleven]'s own failure to document the results of its interview with the patent examiners, [Eleven] is now estopped from showing that the

[6] The only exception is "where … the examiner indicated on the "Examiner Initiated Interview Summary" form … that the examiner will provide a written summary." 37 CFR § 1.2. That exception does not apply. The Examiner never filed such a form, never checked that box, and never provided a written summary. And Eleven's new suggestion that nothing substantive was discussed, *see* Appellant Br. 49, is contradicted by the fact that it substantively amended its claims in response to the interview.

prosecution record is not true ...." *Litton*, 728 F.2d at 1439. Eleven may not profit from its own misconduct.

Finally, Eleven's additional assertion that the Examiner did not rely upon the change from "power down" to "turning off," Appellant Br. 50, is also irrelevant as a matter of law and flatly wrong as a matter of fact. Legally, "a patentee's statements during prosecution, *whether relied on by the examiner or not*, are relevant to claim interpretation." *Microsoft Corp. v. Multi–Tech Sys., Inc.,* 357 F.3d 1340, 1350 (Fed. Cir. 2004) (emphasis added); *see also Laitram Corp. v. Morehouse Indus., Inc.,* 143 F.3d 1456, 1462 (Fed. Cir. 1998). This is because "the interested public has the right to rely on the inventor's statements made during prosecution, without attempting to decipher whether the examiner relied on them, or how much weight they were given." *Fenner*, 778 F.3d at 1325–26. And on the facts, the Examiner did in fact cite the "turning off" limitations (among others) as one of his reasons for allowing the asserted claims:

> [In contrast to the cited prior art], the applicant specifically teaches … the controllers can use the synchronous time domain multiplexing to save power by *turning off* their radio transceivers when they are not receiving or transmitting data; [and] the base transceiver can use the synchronous time domain multiplexing to save power by *turning off* its radio transceiver when it is not receiving or transmitting data. … These limitations, in conjunction with all limitations of the independent claims, have not been disclosed, taught, or made obvious over the prior art of record."

See Appx601–602 (Notice of Allowability) (emphasis added).

* * *

In short, the prosecution history confirms that it was important to distinguish between turning *off* and powering *down*, and thus verifies that the district court's construction is correct and Eleven's proposal is wrong.

3. The specification does not alter the ordinary meaning of "turning off."

The district court also correctly held that "[t]here is no support in the specification for Eleven's contention." Appx14. As discussed above (*see* pp. 5-8), reducing power consumption in idle periods was not part of the originally contemplated invention. As a result, the specification never mentions "turning off" or any variant of that phrase. Appx1003 at 52:16–23.[7] Likewise, none of its embodiments turn anything off or go into a low power state when not transmitting or receiving data. *See generally* Appx21–35.

Eleven argues for the first time on appeal that because the devices can use different levels of transmission power when they *are* transmitting, that somehow means that the claims encompass any sort of reduced power consumption when they are *not* transmitting. Appellant's Br. 34–35, 37–38. This argument is waived. This court

[7] Eleven conceded this at the *Markman* hearing:

> "THE COURT: And I think Microsoft has been clear their view is that turn off doesn't appear anywhere else in the intrinsic evidence other than this change [i.e. the claim amendment in the prosecution history] and then the final claims. You haven't been able to find anywhere else that it is?
> [ELEVEN's COUNSEL]: I'll verify that turn off just appears in the claim."

Appx1003 at 52:16–23

"decline[s] to adjudicate arguments which have not been first presented to the district court," *Great N. Corp. v. Henry Molded Prod., Inc.*, 94 F.3d 1569, 1573 (Fed. Cir. 1996), and here Eleven's failure to raise the argument below has denied Microsoft the chance to make a technical record on this point, including expert testimony and extrinsic evidence.

In any case, Eleven's argument is plainly meritless even on the present record. First, the disclosures Eleven cites are irrelevant. They talk about how to optimize transmission power when the devices are transmitting or receiving, and say nothing about whether the transceivers are completely shut off when they are idle. In wireless communication systems (e.g., Bluetooth) it is common for devices to try and transmit data at an optimal level of power: "loud" enough for other devices to receive the messages clearly, but not so loud that they waste energy or swamp transmissions in nearby wireless systems. Government regulations also limit transmission power; for instance, "[t]he system [of the '062 patent] operates at low transmission power to fit within FCC Part 15 (USA) and RSS 210 (Canada) regulations for Low Power Unlicensed Devices." Appx32 at 7:40–43.

Eleven cites parts of the '062 patent that disclose adjusting transmission power levels to achieve this optimal "loudness." Appellant's Br. 34–35. To do so properly, the transmitting device needs to know how well the receiving device is hearing it. The receiving device must tell it this. It the '062 patent, it does so by first measuring the "receive power" of incoming data, Appx31 at 6:5-9 (cited at Appellant's Br. 32), then

"compar[ing that] against the standard," *id.*, and finally sending the information to the transmitting device in "[data message] packet fields." *Id.*; *see also* Appx33 at 9:66-10:5 and 10:17-23 (cited at Appellant's Br. 32–33, 37–38). These fields thus "carry power level information to dynamically adjust power levels of [the] transmitting device[]." Appx31 at 6:5–9 (cited at Appellant's Br. 32).

None of this has anything to do with whether or not the transceivers are fully turned off when they "are *not* receiving or transmitting data," as in the claims. Eleven suggests that because transmission power is not reduced to zero when the device *is transmitting*, the circuit power is prohibited from going down to zero when the device is *idle*. Appellant's Br. 32, 37. That is plainly wrong. Transceivers obviously cannot be off—*i.e.*, in a no-power state—during the times when they are actively transmitting or receiving, but they certainly can be turned off when they are idle. Indeed, that is the whole point of "sav[ing] power by *turning off* the[] radio transceivers when they are not receiving or transmitting data."

The specification's silence about what happens when the transceivers are not sending or receiving data reinforces that the claim language must be construed in accordance with its ordinary meaning to a skilled artisan and the prosecution history. "[A] claim term is only given a special definition different from the term's plain and ordinary meaning if the patentee clearly sets forth a definition of the disputed claim term other than its plain and ordinary meaning." *Akamai Techs., Inc. v. Limelight Networks, Inc.*, 805 F.3d 1368, 1375 (Fed. Cir. 2015), *cert. denied*, 136 S. Ct. 1661 (2016) (internal

quotation marks and alterations omitted). Here, there is no such definition in the specification.

4. Eleven's other arguments are meritless.

Eleven's remaining arguments are plainly meritless. First, Eleven asserts that "power is to be saved, not eliminated, by turning off the radio transceiver …." Appellant Br. 34. But neither the claim nor the district court's straightforward construction requires "eliminat[ing]" the system's power consumption entirely. They only require turning off part of the system (the "radio transceivers") part of the time ("when [the devices] are not receiving or transmitting data"). The systems "sav[e] power" by turning specific components off when they are not in use.

Second, Eleven alleges that the district court's construction would "render the claimed invention inoperable" because it would "lead to unacceptable delays in game playing." Appellant's Br. 40–42. There is zero evidence in the record to support this and much to contradict it. To begin with, Eleven points to nothing in the specification that says that the system cannot function if the radio transceivers are fully shut down when they are not receiving or transmitting data. *See id.* Nor did Eleven's expert, Dr. Burke, say this. The only statement Eleven quotes from him on this point does not offer even a conclusory opinion that the district court's construction would render the invention inoperable, let alone provide any evidentiary support:

> [T]he '062 Patent teaches a POSITA that saving power by turning off their radio transceivers when they are not receiving or transmitting data *must be viewed in the context of* lowering power

> consumption while at the same time achieving "stringent real time performance" and "low packet transmission latency.

Appellant's Br. 43 (excerpting Appx494 ¶ 31) (emphasis added).

By contrast, there is testimony from Microsoft's expert that no such problem exists. Essentially, the relevant performance characteristics are affected by what the devices do when they are communicating, not whether they are turned off when they are idle:

> Dr. Burke does not assert that there is any inherent inconsistency between, on the one hand, turning off the devices' radio communication components when they are not transmitting and receiving data, and on the other, lowering packet transmission latency and achieving fast system performance. *See, e.g.*, [Appx494 ¶ 31]. Packet transmission latency and system performance depend upon how the transmission components perform while they are *not* idle (among many other things), and not on whether they happen to be off while they are idle.

Appx750 ¶ 20. The system can be fully functional even if "off" really means "off."

Third, Eleven alleges that the district court abused its discretion by not expressly considering this conclusory statement from its expert's declaration plus a few others that paraphrase sentences from the '062 patent's specification. *See* Appellant's Br. 43 (excerpting Appx494 ¶ 31). It was well within the court's discretion to do so. For one thing, "conclusory, unsupported assertions by expert [such as these] … are not useful to a court." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1318–19 (Fed. Cir. 2005). Moreover, a court should only resort to expert testimony "if there were still some genuine ambiguity in the claims, after consideration of all available intrinsic evidence …"

Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1584 (Fed. Cir. 1996), and the district court correctly found that no such ambiguity exists here. Appx14. Finally, even if this were an error, it was harmless. Dr. Burke's statement does not say that the district court's construction renders the system inoperable, provides no evidence for it, and in any case is refuted by Microsoft's expert.

5. Eleven's new proposed construction is waived and meritless

Lastly, the new "alternative" construction Eleven proposes for the first time on appeal ("stopping the operation, activity, or flow of"), Appellant Br. 30, is both waived and wrong on the merits. "[P]resenting proposed claim constructions which alter claim scope for the first time on appeal invokes the doctrine of waiver as to the new claim constructions." *NTP, Inc. v. Research In Motion, Ltd.*, 418 F.3d 1282, 1296 (Fed. Cir. 2005). Here, Eleven suggests that the court adopt a portion of the dictionary definition of "turn off." Appellant Br. 30.

Eleven's newly proposed construction is waived. For one thing, it changes the scope and indeed the entire thrust of Eleven's position before the district court; it makes "turn[ing] off" hinge on the operation or activity of the device rather than whether its power consumption is lowered. Section 1 above. Moreover, neither party advocated this definition as a construction to the district court. Microsoft submitted it as support for its argument that the ordinary meaning of "turn off" is not "lowering power consumption," (Appx516) and Eleven argued that the definition actually "supported" its construction of "lowering power consumption" instead. Appx883 (Eleven's Reply

Br. at 4). Parties are not free, on appeal, to change their construction to any statement in any document they used to support their construction below. This alternative construction is waived.

Eleven's alternative construction also should not be adopted on the merits. As we have discussed, if this definition is interpreted correctly in the context of electronic components, it requires "stop[ping] the … flow of" electrical power to them and thus is consistent with the district court's construction. *See* Section 1 above. But Eleven seeks to interpret the definition in a way that would read "turning off" out of the claims. *Id.* Interpreted that way, the construction is legally wrong. In either case, it should not be adopted.

Finally, this case is not about fine semantic details. The real issue both on appeal and before the district court is whether "turn off" literally means "turn off," or whether it can mean "lowering power consumption" as urged by Eleven. As required by *Eon Corp. IP Holdings v. Silver Spring Networks*, 815 F.3d 1314, 1319-20 (Fed. Cir. 2016) the district court resolved this fundamental dispute between the parties, and it did so in favor of Microsoft since there is nothing in the intrinsic record to support Eleven's attempt to rewrite its claims. This Court should affirm the district court's claim construction and resulting judgment of noninfringement.

C. THE CLAIMS' EXPRESS PERFORMANCE REQUIREMENTS ARE SUBSTANTIVE LIMITATIONS AND ARE INDEFINITE.

This court should also reverse the judgement of no indefiniteness or at least vacate it and remand. The district court erred by holding performance requirements that are expressly set forth in the claim to be meaningless. Appx18. The claims recite a wireless system that "achiev[es] a small system latency with a small standard deviation and therefore minimiz[es] the user's perceived control lag"; the prosecution history shows that these performance requirements are at the heart of the alleged invention; and there is undisputed evidence that they reflect substantive constraints that are not captured elsewhere in the claims. They cannot be ignored.

Moreover, although these performance requirements are an important part of the claim, they do not have a clearly defined scope, and are therefore indefinite. The patent gives no objective standard to determine whether the system latency or its standard deviation are "small" enough, or whether the "user's perceived control lag" is sufficiently "minimized" to fall within the claim.

Finally, while the district court adopted a construction for these requirements despite finding that they are not part of the claim, that construction is wrong as a matter of law and is itself indefinite, at least as Eleven interprets it. If the Court does not reverse the judgment of indefiniteness outright, it should vacate it so that the district court can clarify its construction and consider whether it too is indefinite

1. The performance requirements are substantive claim limitations.

a) The prosecution history shows that the performance elements are key claim elements.

The prosecution history shows that the performance requirements are substantive elements of the invention. Eleven argued to the district court that, because they these requirements are preceded in the claims by the word "thereby," they cannot be substantive. *See* Appx474. That is incorrect. "[W]hen [a] 'whereby' [or 'thereby'] clause states a condition that is material to patentability, it cannot be ignored …." *Hoffer v. Microsoft Corp.*, 405 F.3d 1326, 1329 (Fed. Cir. 2005). Thus, "[t]he terms of a [thereby] clause must be regarded as an essential feature of the invention if it is used to distinguish the invention over the prior art during prosecution." *Digital Tech. Licensing, LLC v. Cingular Wireless, LLC*, No. 06-156, 2007 WL 2300792, at *4 (E.D. Tex. Aug. 7, 2007). That is what happened here.

First, Eleven introduced the performance requirements (along with other language) into the claims to overcome prior art in response to a rejection over references to Sobota and Bodenmann. Appx568 (Feb. 3, 2003 Response p. 12). Second, lest any doubt remain that these requirements were intended to be meaningful, Eleven expressly argued that the "latency" limitations distinguished that prior art. Appx582. It told the examiner that, unlike the invention, Sobota and Bodenmann "did not describe a means for *achieving low latency*, high reliability, and low power consumption all at the same time." Appx582. In fact, this was Eleven's primary (and arguably only)

argument to distinguish these references, as seen in the table below, which sets out Eleven's distinguishing arguments on this point in their entirety:

Argument distinguishing Sobota	Argument distinguishing Bodenmann
"Sobota et al. describe a wireless system which is specifically designed for application in an electronic game device. However, they also do not describe a means for *achieving low latency*, high reliability, and low power consumption all at the same time." (Appx582.)	"Bodenmann et al. describe a wireless system which is designed to be general purpose and is not highly optimized for application in a video game control system (see col 2, lines 16-28). On the other hand, the Applicants' invention is designed specifically for application in a video game control system and has features which are optimized for said application such as a means for *achieving low latency*, high reliability, and low power consumption all at the same time." (*Id.*)

Having told the Patent Office the prior art does not invalidate the claim because it does not "achiev[e] low latency," and having drafted the claim to expressly require "achieving a small system latency," Eleven should not now be allowed to assert it against devices that do not achieve such latency.

Third, subsequent prosecution history confirms that the performance requirement limitation is not empty padding. For one thing, the limitation had to be substantively changed to secure allowance. The original version of the limitation that Eleven introduced to distinguish Sobota and Bodenmann included details about the performance requirements that are not present in the final claim:

> "achieving a small system latency with a small standard deviation—where the mean of the system latency is significantly smaller than the mean of the latency introduced by the electronic game device itself (electronic game devices typically introduce latencies of 8.3mS to 16.7mS as a consequence of their polling -- the control system latency must be small in comparison in order to not be perceived as control lag by the user) …"

Appx568 (markup added). But the Examiner did not allow the claims with this language and instead held the April 9, 2003 interview, discussed in Section B.2.a) above, that Eleven failed to memorialize in writing. Appx594. Eleven then had to amend the claim "pursuant to [the] … interview" by deleting the text highlighted above and modifying the rest to put the limitation its present form. Appx587. Eleven is estopped from arguing that the substance of the interview would have shown the amendment to be unnecessary since it failed in its legal duty to memorialize it in writing. *See Litton*, 728 F.2d at 1439. In any case, if the limitation were a nullity, Eleven would not have had to alter it.

Moreover, after making these changes, Eleven again repeated its argument that the performance requirements (in their revised form) distinguished the prior art, urging that the patent be allowed "[i]n view of the revised new claims and the arguments presented in the [previous] Amendment …." Appx594. The Examiner accepted this argument and allowed the claim, specifically citing the performance requirements among the elements that the prior art of record did not teach. Appx600–603.

The district court thus erred by construing these limitations as superfluous. *See, e.g., Desenberg v. Google, Inc.*, 392 F. App'x 868, 871 (Fed. Cir. 2010) ("wherein" clause

was operative where the examiner required it "as a condition of patentability"); *Digital Tech.*, 2007 WL 2300792, at *4 ("whereby" clause requiring a "highly faithful" signal representation was an operative element because applicants distinguished prior art for having only low-fidelity representations).

b) The performance requirements are not merely a necessary result of implementing the other claim elements.

The district court also erred in reading out the performance requirements because they do not "merely describe the result of arranging the components of the claims in the manner recited in the claims." *Texas Instruments Inc. v. U.S. Int'l Trade Comm'n*, 988 F.2d 1165, 1172 (Fed. Cir. 1993). "Claims are interpreted with an eye toward giving effect to all terms in the claim." *Bicon*, 441 F.3d at 950. Therefore, performance limitations should not be read out of the claim unless they "only express the *necessary* results of what is recited [elsewhere] in the claims" and thus "do not contain any limitations not *inherent* to the" other claim limitations. *Texas Instruments*, 988 F.2d at 1172; *see also C&C Jewelry MFG., Inc. v. West*, No. 09-1303, 2010 WL 2681921, at *4 (N.D. Cal. July 6, 2010) (claim phrase "to provide a pleasing appearance," although akin to a "wherein" clause, was not superfluous because it was "entirely possible to [perform the claimed method in a way] that does not result in a pleasing appearance."). The undisputed evidence of record shows that the performance requirements here add substantive constraints that do not appear anywhere else in the claim.

Microsoft's expert provided undisputed testimony that "[e]ven though the terms 'a small system latency,' 'a small standard deviation,' and 'minimizing the user's perceived control lag' do not have reasonably clear boundaries, it is still clear that they are not necessary results of practicing the other features of the claim." Appx756-757 ¶¶ 60–64. No other language in the claim puts limits on the system latency, its standard deviation, or the user's perceived control lag. *Id.* ¶ 60. Thus, no matter what thresholds might be chosen for these terms of degree, some reasonable implementations of the claim would satisfy them, while other implementations—even some that greatly reduce packet retransmissions[8]—would not. *Id.* ¶¶ 60–64. These limitations thus provide functional constraints that go beyond what is found elsewhere in the claims.

Microsoft's expert provided specific examples of reasonable implementations of the remaining limitations that would lead to poor latency, standard deviation, and lag. For instance, claim 1 contemplates that retransmissions will be reduced by dropping communications channels where interference is detected. Appx35 at 14:13–15 ("channel palette adjustments can be used to dynamically optimize communication reliability by avoiding the use of bad channels suffering from interference …"). But the claim leaves open how much interference must be detected before a channel is dropped. *See id.* at 13:32–14:37. One reasonable approach is to prioritize reliability by dropping

[8] The full language of the claim limitation at issue is: "the frequency hopping and synchronous time domain multiplexing techniques are used in conjunction with one another to help ensure that packets are received intact on the first attempt thus circumventing the need to retransmit damaged packets …" Appx36 14:23–30.

channels that have fairly low amounts of interference, with the result that data would not be transmitted over questionable channels. Appx757 ¶ 61. But this approach would yield poor latency, standard deviation, and lag performance in most circumstances because dropping channels reduces transmission bandwidth so that fewer packets are transmitted overall. *Id.* Another reasonable way to improve reliability and reduce retransmission, consistent with the claim, is to allow each communicating device a relatively long period of time to transmit, thus permitting very robust error correction and modulation schemes. *Id.* ¶ 62. But this too would lead to poor overall latency since non-transmitting controllers would have to wait longer before getting their chance to transmit. *Id.* Thus, the specified performance requirements are not necessary results of the claimed techniques but rather constraints on how the techniques must be implemented. *Id.* ¶ 64.

* * *

The performance requirements are thus substantive, albeit functional, limitations on the claim. "[D]efining a particular claim term by its function is not improper," and does not violate the principle that apparatus claims must be defined structurally. *See Hill-Rom Services, Inc. v. Stryker Corp.*, 755 F.3d 1367, 1374-75 (Fed. Cir. 2014). The district court erred by reading them out.

2. The performance requirements are indefinite terms of degree.

These performance requirements, while substantive, do not have a clearly defined scope, and are thus indefinite. "Definiteness problems often arise when words of degree are used in a claim." *Seattle Box Co. v. Industrial Crating & Packing, Inc.,* 731 F.2d 818, 826 (Fed.Cir.1984). After *Nautilus*, "it is no[longer] enough … to identify 's*ome standard* for measuring the scope of the phrase.'" *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1370–71 (Fed. Cir. 2014). Rather, "the claims … must provide objective boundaries for those of skill in the art," *id.*, and "there is an indefiniteness problem if the claim language might mean several different things and no informed and confident choice is available among the contending definitions." *Id; see also GE Lighting Soln's v. Lights of Am., Inc.,* No. 2015-1979, 2016 WL 6301307, at *1–*2 (Fed. Cir. Oct. 27, 2016) (term of degree "elongated" was indefinite for lack of an objective test to determine how much extension in length was intended). Such objective boundaries are lacking here, because the patent does not provide a standard to determine whether the latency or its standard deviation are "small" enough, or whether the "user's perceived control lag" is sufficiently "minimized" to fall within the claims.

The specification does none of the things that this court has suggested to "resolve the ambiguities" of such limitations. *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1255-56 (Fed. Cir. 2008). It gives no "quantitative metric," *id.*, for system latency, standard deviation, or control lag; provides no "formula for calculating"

them, *id.*; and offers no "examples that meet the claim limitation and examples that do not." *Id.* Indeed, it never even mentions "standard deviation," "control lag" or any related term. And while it makes passing mention of other kinds of "latency" (not "system latency"), these passages say only that a small latency is desirable, not what a small latency *is*. *See, e.g.*, Appx21–37 ('062 patent) at Abstract, 7:51-57, 12:44-49. Merely "disclos[ing] … benefits of the invention" does not "provide an objective way of determining the scope of the claims." *Halliburton*, 514 F.3d at 1252 n.3.

The prosecution history makes the ambiguity worse because, as discussed above, Eleven set out but then expressly deleted its understanding of what a "small" system latency is. *See* Section 1.a) above. It tried to include the definition quoted above, including "latencies of 8.3mS to 16.7mS" (Appx568), but had to delete this after an interview with the Examiner. *See id.* Since concepts deleted by amendment cannot be recaptured through claim construction, *see BENQ*, 533 F.3d at 1370, this history tells us that the test is *not* what applicants thought it was, which further blurs what the test *is*.

Separately, "a user's perceived control lag" is indefinite because it is subjective and mutable. *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244 (Fed. Cir. 2008) is on point. Faced with a vague term of degree (a "fragile" gel for oil wells) the patentees there seized upon a desirable feature (the ability to suspend certain materials) and argued that any gel that adequately enabled it satisfied the claim. *Id.* at 1254. This court held that this would not save the claim. *Id.* It noted that "a wide variety of factors could affect adequacy (formation geology, wellbore size, depth, angle, etc.)," with the result

that "a given fluid might be adequate to suspend [the materials] in some formations and/or well configurations, whereas in others it would not be." *Id.* It reasoned that "a construction that results in an artisan not knowing from one [configuration] to the next whether a particular composition standing alone is within the claim scope or not [is] the epitome of indefiniteness." *Id.*

A skilled artisan faces the same problem here. She cannot tell whether a given game system "standing alone is within the claim scope," *id.* at 1254, because the amount of control lag that the user of the game system will "perceive" depends on an even wider variety of external factors than were present in *Halliburton*. It varies radically from game to game, network to network, and screen to screen. Appx755–756 (Microsoft expert declaration) ¶¶ 51–58. For example, average users' perceptions of latency differ widely based on the kind of game they are playing. *Id.* For some racing games, users perceive lag over 50 milliseconds (ms); for shooting games, 100 ms; for sports games, 750 ms; for strategy games, over 1,000 ms; and so on. *See id.* ¶ 53. Moreover, even within the same game, "it is not so simple to determine the latency requirements [because the game] might have a number of different types of actions." *Id.* ¶ 54 (quoting book). Furthermore, some games have internal lag compensation mechanisms that further affect perceived delay. *Id.* ¶ 55. Many other factors affect it too, including the speed of the user's display, *id.* ¶ 56; the game's animation speed, *id.*; and outside wireless interference. *Id.* In short, the claim "requires that an artisan make a separate infringement determination for every set of circumstances in which the [game system]

may be used" and, as a result, is the "epitome of indefiniteness." *Halliburton*, 514 F.3d at 1254; *Geneva Pharm., Inc. v. GlaxoSmithKline PLC*, 349 F.3d 1373, 1384 (Fed. Cir. 2003) (same).

Lastly, "a user's perceived control lag" is also indefinite because it is "facially subjective claim language without an objective boundary." *Interval Licensing,* 766 F.3d at 1373. Even holding all other factors equal, different users "perceive" different amounts of delay or lag. Appx756 ¶ 57. In fact, even a single player's ability to perceive lag changes as he or she become more experienced. *Id.* Such constraints are indefinite. 766 F.3d at 1373.

3. The district court's construction of the performance requirements is incorrect, unclear, and itself potentially indefinite.

The district court did not find that the claim language is reasonably clear standing alone. *See* Appx18. Rather, as in *Halliburton*, it identified a desirable feature of video game systems—here "real time video game performance"—and reduced all three terms of degree to this concept. *Id.* Its construction drastically revised the claim language:

Claim language	District court's construction
"achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag"	"achieving consistently small system delay that enables real time wireless video game performance."

This was an error for two reasons. First, the construction is wrong: the court cites no support for this drastic rewrite of the claim language, Appx18, and there is

none. Second, the construction does not resolve the dispute between the parties about claim scope—they dispute what "real time" means in this context—and if it is interpreted as Eleven proposes then the construction is itself indefinite. *Eon*, 815 F.3d at 1320 (court must resolve disputes of claim scope between parties); *Every Penny Counts, Inc. v. Am. Express Co.*, 563 F.3d 1378, 1383 (Fed. Cir. 2009) (court's obligation to resolve claim-scope disputes can require derivative construction of words in a claim construction).

(1) The district court's construction is incorrect.

The district court erred by adopting Eleven's proposal to rewrite the performance requirements limitation via claim construction. Courts "construe the claim as written, not as the patentees wish they had written it." *Chef Am., Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1374 (Fed. Cir. 2004). Here, the claim specifies three metrics by which an infringing device must be evaluated—"system latency," its "standard deviation," and the "user's perceived control lag." Moreover, "achieving low latency" was a key basis for distinguishing the prior art during prosecution. *See* Section 1.a) above. The district court was wrong to rewrite these metrics and to reduce them to the undefined concept of "real time video game performance."

Indeed, the district court's construction makes the terms even vaguer than they already are. For example, it substitutes "consistently"—a purely functional word—for the claim's "standard deviation," which at least specifies which of the many possible statistical measures of consistency is to be used, *see* A754 (Microsoft expert declaration)

¶ 48 (citing textbook that lists five statistical measures of consistency), even though it does not say how small the standard deviation must be. Likewise, the district court substitutes the vague "system delay" for the slightly more specific "system latency." *Id.* ¶¶ 45–47. Finally, it reads "user's perceived control lag" out of the claim entirely. *See* Appx755 ¶ 49.

The district court gave no reasoning and cited no evidence to justify revising the claim this way. A18. Nor did Eleven in its briefs. Eleven pointed to just one fragment of just one sentence from the specification, Appx476–477, which does not remotely justify re-writing the claims:

> "The invention also supports controller input/output functions and programming capabilities and interfacing between the controller and an electronic game device with the following characteristics:
> 1) *low packet transmission latency with stringent real time performance* …"

Appx34 at 12:44–49 (emphasis added). The sentence this fragment comes from lists ten separate "characteristics" that the invention ostensibly "supports," among which is "low packet transmission latency with stringent real time performance." *Id.* It does not say that "real time performance" defines what it *means* to have a "small" system latency and deviation or to "minimize" lag. *Id.*; *see also* Appx755 (Microsoft expert declaration) ¶ 50. In fact, it does not even mention these terms. *Id.* Nor does it support substituting "consistently" for the claim's "standard deviation." *Id.* It also does not support replacing "system latency" with "system delay" or reading "minimizing the user's perceived control lag" out of the claim.

This Court should thus reject the district court's construction and hold the performance requirements indefinite for the reasons set out in Section 2 above.

(2) The district court's construction is itself indefinite as Eleven interprets it.

If this court does not reverse the judgment of no indefiniteness, it should at least vacate it. "[C]laim construction requires the court to determine what claim scope is appropriate in the context of the patents-in-suit." *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1361 (Fed. Cir. 2008). A determination that a claim term 'needs no construction' … may be inadequate … when reliance on a term's 'ordinary' meaning does not resolve the parties' dispute." Here, the district court's construction did not resolve the parties' dispute about what "real time" means, and Eleven's interpretation would make the district court's construction itself indefinite.

During claim construction, the parties disputed what "real time" means. Eleven asserted with no evidentiary support that it means "that the user of the game system will not be able to perceive any delay during game play." Appx476 (Eleven's Op. Br. below, p. 11). By contrast, Microsoft argued that, as this court held in *Paragon Sols., LLC v. Timex Corp.*, 566 F.3d 1075 (Fed. Cir. 2009), the ordinary meaning of "real time" is instead "without any intentional delay …." Appx890 (citing *Paragon*, 566 F.3d at 1092), and that the '062 patent's specification, which calls for "s*tringent* real time performance" requires at least that much immediacy. *Id.* The district court used "real time" in its construction without resolving this dispute.

However, the district court's construction is itself indefinite under Eleven's interpretation. Read that way, infringement again turns on users' *perceptions* of delay, which are subjective and mutable, varying from user to user, game to game, network to network, and screen to screen. *See* Section 2 above. This is the "epitome of indefiniteness." *Halliburton*, 514 F.3d at 1254; *Geneva Pharm.*, 349 F.3d at 1384; *see also Paragon Sols.*, 566 F.3d at 1090, 1092 (rejecting similarly protean construction of "real time" as "… without contextually meaningful delay" because under it, "the same apparatus might infringe when used in one activity, but not infringe when used in another.")

CONCLUSION

This court should affirm the district court's construction of "saving power by turning off" and the judgment of noninfringement that follows from that. It should also reverse the judgement of no indefiniteness or at least vacate it and remand for the district court to clarify its construction and determine if it too is indefinite.

Dated: November 21, 2016

Respectfully submitted,

/s/ John W. Thornburgh

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ADDENDUM

ADDENDUM TABLE OF CONTENTS

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ELEVEN ENGINEERING, INC. and ELEVEN ENGINEERING GAME CONTROL LLC, Plaintiffs, v. MICROSOFT CORPORATION, Defendant.	C.A. No. 1:09-cv-00903-LPS

[PROPOSED] FINAL JUDGMENT AND ORDER

WHEREAS, this is a patent infringement action brought by plaintiffs, Eleven Engineering, Inc. and Eleven Engineering Game Control, LLC (collectively "Eleven Engineering") against defendant, Microsoft Corporation ("Microsoft");

WHEREAS, this Court has jurisdiction over the claims in this action pursuant to 28 U.S.C. §§ 1331 and 1338;

WHEREAS, Eleven Engineering has asserted that Microsoft infringes claims 1, 4 and 6-9 of United States Patent No. 6,684,062 ("the '062 patent"). Specifically, Eleven Engineering has asserted that certain of Microsoft's Xbox 360 game systems and products (including console/controller bundles) (the "Accused Products") infringe claims 1, 4 and 6-9 of the '062 patent ("the asserted claims");

WHEREAS, Microsoft denies infringement and has asserted a number of affirmative defenses, including that the asserted claims of the '062 patent are invalid for indefiniteness under 35 U.S.C. § 112(b);

WHEREAS, on June 23, 2016, this Court issued a Memorandum Opinion (D.I. 192) and Order (D.I. 193) on claim construction.

WHEREAS, the parties have jointly requested that the Court amend its Order construing the disputed claim terms;

WHEREAS, this Court has amended its prior Order (D.I. 193) to include its constructions of "radio transceiver" and "... turning off ..." as set forth in its June 23, 2016 Memorandum Opinion (D.I. 192) and issues its Amended Claim Construction Order which sets forth its constructions of the disputed claim terms as follows:

Claim Term	Court's Construction
"the controllers [base transceiver] can use the synchronous time domain multiplexing to save power by turning off their [its] radio transceivers when they are [it is] not receiving or transmitting data" [claims 1, 4, and 6-9 of the '062 patent]	"the [controllers/base transceiver] can use the synchronous time domain multiplexing to save power by turning off [their/its] radio transceivers when [they are/it is] not receiving or transmitting data, where 'turning off' means a state of no power"

"radio transceiver" [claims 1, 4, and 6-9 of the '062 patent]	"circuitry for transmitting or receiving radio frequency signals"
"base transceiver" [claims 1, 4, and 6-9 of the '062 patent]	"device capable of both transmitting and receiving data and commands, and translating data and commands into a format understandable by another device such as an electronic game device or console"
"achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag" [claims 1, 4, and 6-9 of the '062 patent]	"achieving consistently small system delay that enables real time wireless video game performance"

WHEREAS, Eleven Engineering respectfully disagrees with the Court's construction of the claim element, "the controllers [base transceiver] can use the synchronous time domain multiplexing to save power by turning off their [its] radio transceivers when they are [it is] not receiving or transmitting data," including the Court's construction of "turning off" to mean "a state of no power";

WHEREAS, Microsoft respectfully disagrees with the Court's constructions of the claim elements "radio transceiver," "base transceiver," and "achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag," including the Court's holding that these terms are not indefinite;

WHEREAS, Eleven Engineering concedes, without prejudice to an appeal and its right to reinstatement of its claim of infringement in the event of remand, vacatur or reversal by the U.S. Court of Appeals for the Federal Circuit for further

proceedings on its claim of infringement of the '062 patent, that it cannot meet its burden of proof of infringement of the '062 patent with respect to the Accused Products due to the Court's construction of the claim element, "the controllers [base transceiver] can use the synchronous time domain multiplexing to save power by turning off their [its] radio transceivers when they are [it is] not receiving or transmitting data" because of the Court's construction of "turning off" in that claim element to mean "a state of no power" as set forth in the Court's June 23, 2016 Memorandum Opinion;

WHEREAS, Microsoft concedes, without prejudice to an appeal and its right to reinstatement of its claims of indefiniteness of the '062 patent in the event of remand, vacatur or reversal by the U.S. Court of Appeals for the Federal Circuit for further proceedings, that it cannot meet its burden of proving that the asserted claims of the '062 patent are invalid as indefinite because of the Court's ruling in the Court's claim construction opinion (D.I. 192) that the disputed claim terms are not indefinite (D.I. 192);

IT IS HEREBY ORDERED that final judgment is entered against Eleven Engineering on its claim that Microsoft infringes the '062 patent;

IT IS FURTHER ORDERED that this final judgment is a final, appealable judgment that is subject to the same right of appeal that Eleven Engineering would have in the event a final judgment of non-infringement had been entered following either a dispositive ruling by the Court or a jury verdict due to the Court's construction of "turning off" to mean "a state of no power";

IT IS FURTHER ORDERED that final judgment is entered against Microsoft on its

defense that the asserted claims of the '062 patent are invalid as indefinite under 35 U.S.C. § 112(b);

IT IS FURTHER ORDERED that this final judgment is a final, appealable judgment that is subject to the same right of appeal that Microsoft would have in the event a final judgment denying Microsoft's defense that the asserted claims of the '062 patent are indefinite had been entered following either a dispositive ruling by the Court or a jury verdict;

IT IS FURTHER ORDERED that Microsoft's other affirmative defenses, including all Microsoft's other invalidity defenses, are dismissed without prejudice to Microsoft's right to reassert its defenses in the event of remand or other assertions by Eleven Engineering under the '062 patent; and

IT IS FURTHER ORDERED that any request for attorneys' fees and/or costs shall be deferred until after the final resolution of the appeal in this action.

So ordered this 13th day of July 2016.

HON. LEONARD P. STARK
UNITED STATES DISTRICT JUDGE

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ELEVEN ENGINEERING, INC. and ELEVEN ENGINEERING GAME CONTROL LLC, Plaintiffs, v. MICROSOFT CORPORATION, Defendant.	C.A No. 1:09-cv-00903-LPS

[PROPOSED] AMENDED CLAIM CONSTRUCTION ORDER

WHEREAS on June 23, 2016, the Court issued a Memorandum Opinion (D.I. 192) and Order (D.I. 193) on the construction of the disputed claim terms of U.S. Patent No. 6,684,062 ("the '062 patent"); and

WHEREAS the parties having jointly requested that the Court amend its Order (D.I. 193) to more closely reflect the Court's June 23, 2016 Memorandum Opinion (D.I. 192)—specifically, by including the Court's construction of the term "radio transceiver" that was omitted from the Order and by expressly including the Court's conclusion that "turning off" means "a state of no power";

WHEREAS the Court agrees to amend the claim construction Order (D.I. 193);

At Wilmington, this 11th day of July 2016:

IT IS HEREBY ORDERED, for the reasons set forth in the Court's Memorandum Opinion issued June 23, 2016 (D.I. 192), the Order dated June 23, 2016

(D.I. 193) is hereby amended and the disputed claim terms of the '062 patent are construed as follows:

Claim Term	Court's Construction
"the controllers [base transceiver] can use the synchronous time domain multiplexing to save power by turning off their [its] radio transceivers when they are [it is] not receiving or transmitting data" [claims 1, 4, and 6-9 of the '062 patent]	"the [controllers/base transceiver] can use the synchronous time domain multiplexing to save power by turning off [their/its] radio transceivers when [they are/it is] not receiving or transmitting data, where 'turning off' means a state of no power"
"radio transceiver" [claims 1, 4, and 6-9 of the '062 patent]	"circuitry for transmitting or receiving radio frequency signals"
"base transceiver" [claims 1, 4, and 6-9 of the '062 patent]	"device capable of both transmitting and receiving data and commands, and translating data and commands into a format understandable by another device such as an electronic game device or console"
"achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag" [claims 1, 4, and 6-9 of the '062 patent]	"achieving consistently small system delay that enables real time wireless video game performance"

HON. LEONARD P. STARK
UNITED STATES DISTRICT JUDGE

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ELEVEN ENGINEERING, INC. and ELEVEN ENGINEERING GAME CONTROL LLC,	:	
Plaintiffs,	:	C.A. No. 09-903-LPS
v.	:	
MICROSOFT CORPORATION,	:	
Defendant.	:	

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MEMORANDUM OPINION

June 23, 2016
Wilmington, Delaware

STARK, U.S. District Judge:

This is a patent infringement action brought by Plaintiffs Eleven Engineering, Inc. and Eleven Engineering Game Control LLC ("Eleven" or "Plaintiffs"). Eleven filed suit against Microsoft Corporation ("Microsoft" or "Defendant"), asserting that Microsoft infringed U.S. Patent No. 6,684,062 (the "'062 patent"). The patents relate generally to wireless radio frequency game control systems.

The parties submitted claim construction briefs (D.I. 108, 112, 119, and 127) and the Court held a claim construction hearing on April 25, 2016 ("Tr.").

I. LEGAL STANDARDS

The ultimate question of the proper construction of a patent is a question of law. *See Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 837 (2015) (citing *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 388-91 (1996)). "It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (internal quotation marks omitted). "[T]here is no magic formula or catechism for conducting claim construction." *Id.* at 1324. Instead, the court is free to attach the appropriate weight to appropriate sources "in light of the statutes and policies that inform patent law." *Id.*

"[T]he words of a claim are generally given their ordinary and customary meaning . . . [which is] the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Id.* at 1312-13 (internal citations and quotation marks omitted). "[T]he ordinary meaning of a claim term is its meaning to the ordinary artisan after reading the entire patent." *Id.* at 1321 (internal

quotation marks omitted). The patent specification "is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996).

While "the claims themselves provide substantial guidance as to the meaning of particular claim terms," the context of the surrounding words of the claim also must be considered. *Phillips*, 415 F.3d at 1314. Furthermore, "[o]ther claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment . . . [b]ecause claim terms are normally used consistently throughout the patent . . . ." *Id.* (internal citation omitted).

It is likewise true that "[d]ifferences among claims can also be a useful guide . . . . For example, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim." *Id.* at 1314-15 (internal citation omitted). This "presumption is especially strong when the limitation in dispute is the only meaningful difference between an independent and dependent claim, and one party is urging that the limitation in the dependent claim should be read into the independent claim." *SunRace Roots Enter. Co., Ltd. v. SRAM Corp.*, 336 F.3d 1298, 1303 (Fed. Cir. 2003).

It is also possible that "the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor's lexicography governs." *Phillips*, 415 F.3d at 1316. It bears emphasis that "[e]ven when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction." *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1372 (Fed. Cir. 2014) (quoting *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358

F.3d 898, 906 (Fed. Cir. 2004)) (internal quotation marks omitted).

In addition to the specification, a court "should also consider the patent's prosecution history, if it is in evidence." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996). The prosecution history, which is "intrinsic evidence," "consists of the complete record of the proceedings before the PTO [Patent and Trademark Office] and includes the prior art cited during the examination of the patent." *Phillips*, 415 F.3d at 1317. "[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." *Id.*

In some cases, "the district court will need to look beyond the patent's intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." *Teva*, 135 S. Ct. at 841. Extrinsic evidence "consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." *Markman*, 52 F.3d at 980. For instance, technical dictionaries can assist the court in determining the meaning of a term to those of skill in the relevant art because such dictionaries "endeavor to collect the accepted meanings of terms used in various fields of science and technology." *Phillips*, 415 F.3d at 1318. In addition, expert testimony can be useful "to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field." *Id.* Nonetheless, courts must not lose sight of the fact that "expert reports and testimony [are]

generated at the time of and for the purpose of litigation and thus can suffer from bias that is not present in intrinsic evidence." *Id.* Overall, while extrinsic evidence "may be useful" to the court, it is "less reliable" than intrinsic evidence, and its consideration "is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence." *Id.* at 1318-19. Where the intrinsic record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper. *See Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1308 (Fed. Cir. 1999) (citing *Vitronics*, 90 F.3d at 1583).

Finally, "[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998). It follows that "a claim interpretation that would exclude the inventor's device is rarely the correct interpretation." *Osram GmbH v. Int'l Trade Comm'n*, 505 F.3d 1351, 1358 (Fed. Cir. 2007) (quoting *Modine Mfg. Co. v. U.S. Int'l Trade Comm'n*, 75 F.3d 1545, 1550 (Fed. Cir. 1996)).

II. CONSTRUCTION OF DISPUTED TERMS[1]

A. "the controllers [base tranceiver] can use the synchronous time domain multiplexing to save power by turning off their [its] radio tranceivers when they are [it is] not receiving or transmitting data"[2]

Eleven "the controllers [base tranceiver] can use a synchronized polling process, specified time slots or similar detection and coordination method with different intervals of time to carry multiple signals on the same RF frequency or channel to lower power consumption of their [its] radio tranceivers when they are [it is] not receiving or transmitting data"
Microsoft Indefinite. If not found indefinite, then "the controllers [base tranceiver] can use the synchronous time domain multiplexing to save power by turning off their [its] radio tranceivers when they are [it is] not receiving or transmitting data" where "radio tranceiver" is construed as Microsoft proposes below.
Court "the [controllers/base tranceiver] can use the synchronous time domain multiplexing to save power by turning off [their/its] radio tranceivers when [they are/it is] not receiving or transmitting data"

The parties disagree about whether the claimed controllers save power by "turning off" their tranceivers when the controllers are not receiving or transmitting data, or whether the claimed controllers need only "lower power consumption" through the use of time domain multiplexing.

The claims specify that the controllers "save power ***by turning off***" radio tranceivers when they are not receiving or transmitting data. ('062 pat. col. 14:31-34) (emphasis added) A Court's construction "must give meaning to all the words in [the] claims." *Funai Elec. Co. v. Daewoo*

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[1]Plaintiffs previously asserted U.S. Patent No. 6,346,047 (the "'047 patent") against Microsoft, but the parties resolved their respective claims for relief related to the '047 prior to the claim construction hearing. (D.I. 168) For this reason, the Court did not hear argument on previously-disputed terms of the '047 patent, nor will it address them in this Opinion.

[2]This term appears in claims 1, 4, and 6-9 of the '062 patent.

Elecs. Corp., 616 F.3d 1357, 1372 (Fed. Cir. 2010). Although Eleven argues that time domain multiplexing ***could*** be used to lower power consumption without turning off the tranceivers (and that such an approach would in practice be preferable to turning the tranceivers entirely off), the record is devoid of intrinsic evidence to support the view that a person of ordinary skill in the art would have understood the claims to be using the words "sav[ing] power by ***turning off***" (emphasis added) to include methods of saving power other than simply shutting it off. There is no support in the specification for Eleven's contention. Moreover, during prosecution of the '062 patent, the patentee amended the claim from "power down" to "turn off." (*See* D.I. 113-1 at 42; D.I. 113-1 at 61) Whereas "power down" might imply one or more interim settings between "on" and "off," "turn off" more strongly connotes a state of no power.

In light of the intrinsic record, the Court need not consider the parties' extrinsic evidence, consisting principally of expert declarations. (*See* D.I. 109, 126 (Declarations of Eleven's expert Shawn Burke); D.I. 120 (Declaration of Microsoft's expert Peter Rysavy)) In any event, the Court would not rely on extrinsic evidence that contradicts the intrinsic evidence. Accordingly, the Court declines to adopt Eleven's proposal that it construe "turning off" as "lower[ing] power consumption."

The parties also disagree about the meaning of the term "time domain multiplexing," or "TDM." Eleven contends that the term is limited to a synchronized polling process, specified time slots, or similar detection and coordination methods with different intervals of time to carry multiple channel signals. In support of Eleven's argument, Eleven's expert states, without citing support, that a person of ordinary skill in the art would understand from the specification that TDM "involves the use of a synchronized polling process or . . . . similar detection and

coordination methods that employ different intervals of time to carry multiple signals on the same RF frequency or channel." (D.I. 109 ¶ 30) This conclusory statement does not, in light of the record, provide a sufficient basis for limiting the claims as Eleven suggests. The Court adopts Microsoft's proposed construction.

B. "radio tranceiver" and "base tranceiver"[3]

Eleven radio tranceiver: "circuitry for transmitting or receiving radio frequency signals" base tranceiver: "communication translation device"
Microsoft radio tranceiver: Indefinite. If not found indefinite, then "RF module that receives and transmits RF signals, containing a central microprocessor, a modulator, a demodulator, an oscillator, an amplifier, an RF switch, a bandpass filter, an antenna, a post detection filter, a data slicer circuit, and a received signal strength indicator (as shown in Fig. 10)" base tranceiver: Indefinite.
Court radio tranceiver: "circuitry for transmitting or receiving radio frequency signals" base tranceiver: "device capable of both transmitting and receiving data and commands, and translating data and commands into a format understandable by another device such as an electronic game device or console"

Microsoft contends that these terms are indefinite. A patent claim is indefinite if, "viewed in light of the specification and prosecution history, [it fails to] inform those skilled in the art about the scope of the invention with reasonable certainty." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014). A party who challenges the validity of a patent or claim has the burden of establishing invalidity. *Id.* at 2130 n.10 (citing 35 U.S.C. § 282). In general, invalidity must be proven by "clear and convincing evidence." *Microsoft Corp. v. i4i Ltd.*

[3]This term appears in claims 1, 4, and 6-9 of the '062 patent.

Partnership, 564 S.Ct. 2238, 2242 (2011) (discussing burden of proof for invalidity defenses). Microsoft has not met this heavy burden with respect to either term.

The intrinsic record unambiguously describes what a radio transceiver is. The claims describe the claimed game controllers and base transceiver as having "radio tranceivers" that can transmit and receive data. '062 patent col. 14:30-36. The specification discloses a base tranceiver that transmits data to and receives data from a controller via an "RF module." *Id.* at 14:30-36. The patent explains that "RF" means "radio frequency." *Id.* at 2:15-17. Taken together, these disclosures make clear that the term "radio tranceiver" refers to an apparatus capable of sending and receiving radio frequency signals. Eleven's expert confirms that a person of ordinary skill in the art would understand the patent this way, and would understand that a radio transceiver consists of circuitry, such as that disclosed in Figure 10.[4] (D.I. 109 at 15-6)

The specification also makes clear what a base transceiver is, and how it differs from a radio transceiver. The claims themselves indicate that a base transceiver includes a radio transceiver. *Id.* at 14:35-37 ("the base tranceiver can . . . turn off ***its*** radio tranceiver") (emphasis added). The base tranceiver also has additional capabilities, as set forth in each individual claim. For example, claim 1 requires a base tranceiver "capable of relaying the data received from the controllers to the electronic game device[,] thus allowing the users to remotely control the electronic game device." '062 patent col. 13:40-43. Eleven's expert states that a person of ordinary skill in the art would understand the base tranceiver apparatus to be a "communication translation device," that is, "a device that can both transmit and receive data and commands, and

---

[4]The Court is not, however, persuaded that the term "radio tranceiver" must be limited to the preferred embodiment outlined in Figure 10.

can translate data and commands into a format understandable by another device such as an electronic game device or console." (D.I. 109 at 16-17) This description is consistent with the claims themselves, as well as the descriptions of preferred embodiments of the base tranceiver disclosed in the specification. '062 pat. col. '4:25-41; 4:42-48; 11:66-12:1.

Neither Microsoft nor its expert disagrees with these points. Microsoft instead argues that a reasonably skilled artisan would not know with reasonable certainty which apparatus is part of the "base transceiver" and which apparatus is part of the "radio transceiver" – and, thus, would not know which apparatus must be "turn[ed] off" to save power when not receiving or transmitting data. (D.I. 120 ¶ 8; D.I. 119 at 8) Although the Court may eventually be required to resolve factual disputes in order to distinguish the claimed "radio transceiver" from the "base transceiver," Defendant's assertions do not amount to clear and convincing evidence that a person of ordinary skill in the art would not, with reasonable certainty, be able to make this distinction. Therefore, the Court finds that these claim terms have not been proven indefinite, and adopts constructions consistent with the representations made by Plaintiffs and their expert.

C. "achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag"[5]

Plaintiffs "achieving consistently small system delay that enables real time wireless video game performance"
Defendants "a small system latency": Indefinite. "a small standard deviation": Indefinite. "minimizing the user's perceived control lag": Indefinite.

[5]This term appears in claims 1, 4, and 6-9 of the '062 patent.

Court
"achieving consistently small system delay that enables real time wireless video game performance"

Defendants argue that each term of degree in this claim term is indefinite. The Court disagrees. The disputed term, when read in its full context, describes the result of using "frequency hopping and synchronous time domain multiplexing techniques . . . in conjunction with one another to help ensure that packets are received intact on the first attempt." '062 pat. col. 14:23-30. Such laudatory language describes the value of the claimed invention, but does not impose structural limitations. *See Minton v. Nat'l Ass'n of Sec. Dealers, Inc.*, 336 F.3d 1373, 1381 (Fed. Cir. 2003). The Court finds that the claim term has not been proven indefinite.

III. CONCLUSION

The Court will construe the disputed terms as explained above. An appropriate Order will be entered.

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ELEVEN ENGINEERING, INC. and ELEVEN ENGINEERING GAME CONTROL LLC	:	
Plaintiffs,	:	
	:	C.A. No. 09-903-LPS
v.	:	
MICROSOFT CORPORATION,	:	
Defendants	:	

ORDER

At Wilmington, this **23rd** day of **June, 2016**:

For the reasons set forth in the Memorandum Opinion issued this date,

IT IS HEREBY ORDERED that the disputed claim terms of U.S. Patent No. 6,684,062 (the "'062 patent") are construed as follows:

Claim Term	Court's Construction
"the controllers [base tranceiver] can use the synchronous time domain multiplexing to save power by turning off their [its] radio tranceivers when they are [it is] not receiving or transmitting data" [claims 1, 4, and 6-9 of the '062 patent]	"the [controllers/base tranceiver] can use the synchronous time domain multiplexing to save power by turning off [their/its] radio tranceivers when [they are/it is] not receiving or transmitting data"

"radio tranceiver" and **"base tranceiver"** [claims 1, 4, and 6-9 of the '062 patent]	"device capable of both transmitting and receiving data and commands, and translating data and commands into a format understandable by another device such as an electronic game device or console"
"achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag" [claims 1, 4, and 6-9 of the '062 patent]	"achieving consistently small system delay that enables real time wireless video game performance"

HON. LEONARD P. STARK
UNITED STATES DISTRICT JUDGE

US006684062B1

(12) **United States Patent**
Gosior et al.

(10) **Patent No.: US 6,684,062 B1**
(45) **Date of Patent: Jan. 27, 2004**

(54) **WIRELESS GAME CONTROL SYSTEM**

(75) Inventors: **Jason Gosior**, Edmonton (CA); **Colin Broughton**, Edmonton (CA); **Louis Garner**, Edmonton (CA); **Robert Erickson**, Edmonton (CA); **John Sobota**, Edmonton (CA)

(73) Assignee: **Eleven Engineering Incorporated**, Edmonton (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 152 days.

(21) Appl. No.: **09/696,570**

(22) Filed: **Oct. 25, 2000**

(51) **Int. Cl.**[7] **H04B 1/38**
(52) **U.S. Cl.** **455/73**; 455/552.1; 455/74; 455/63.1; 455/66.1; 455/426.1; 455/67.11; 375/346; 375/347; 725/133; 725/86
(58) **Field of Search** 455/73, 74, 66, 455/552, 426, 466, 46, 42, 67.11; 375/346, 347; 725/133, 86, 141, 39; 348/14.03

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5,451,053	A		9/1995	Garrido
5,533,010	A	*	7/1996	Tanaka 370/342
5,551,701	A		9/1996	Bouton et al.
5,605,505	A		2/1997	Han
5,618,045	A		4/1997	Kagan et al.
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5,816,920	A		10/1998	Hanai
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"Specification of the Bluetooth System," as published by the Bluetooth Special Interest Group, vol. 1, /dec, 1, 1999, vl. 0B, pp. 41–126 and pp. 327–369.

* cited by examiner

Primary Examiner—Charles Appiah
Assistant Examiner—Marceau Milord
(74) *Attorney, Agent, or Firm*—Terrence N. Kuharchuk; Rodman & Rodman

(57) **ABSTRACT**

A wireless system for video game control comprised of a base transceiver engaged with an electronic game device where said base transceiver communicates wirelessly with one or more wireless controllers concurrently and which implements a variety of techniques to achieve significant advantages in the areas of latency, reliability, power consumption, and cross platform compatibility.

18 Claims, 7 Drawing Sheets

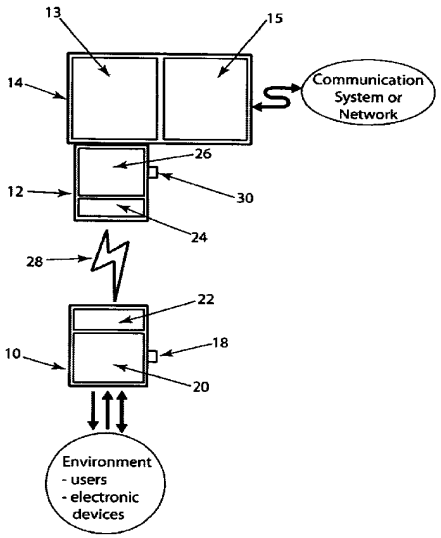


FIG. 1

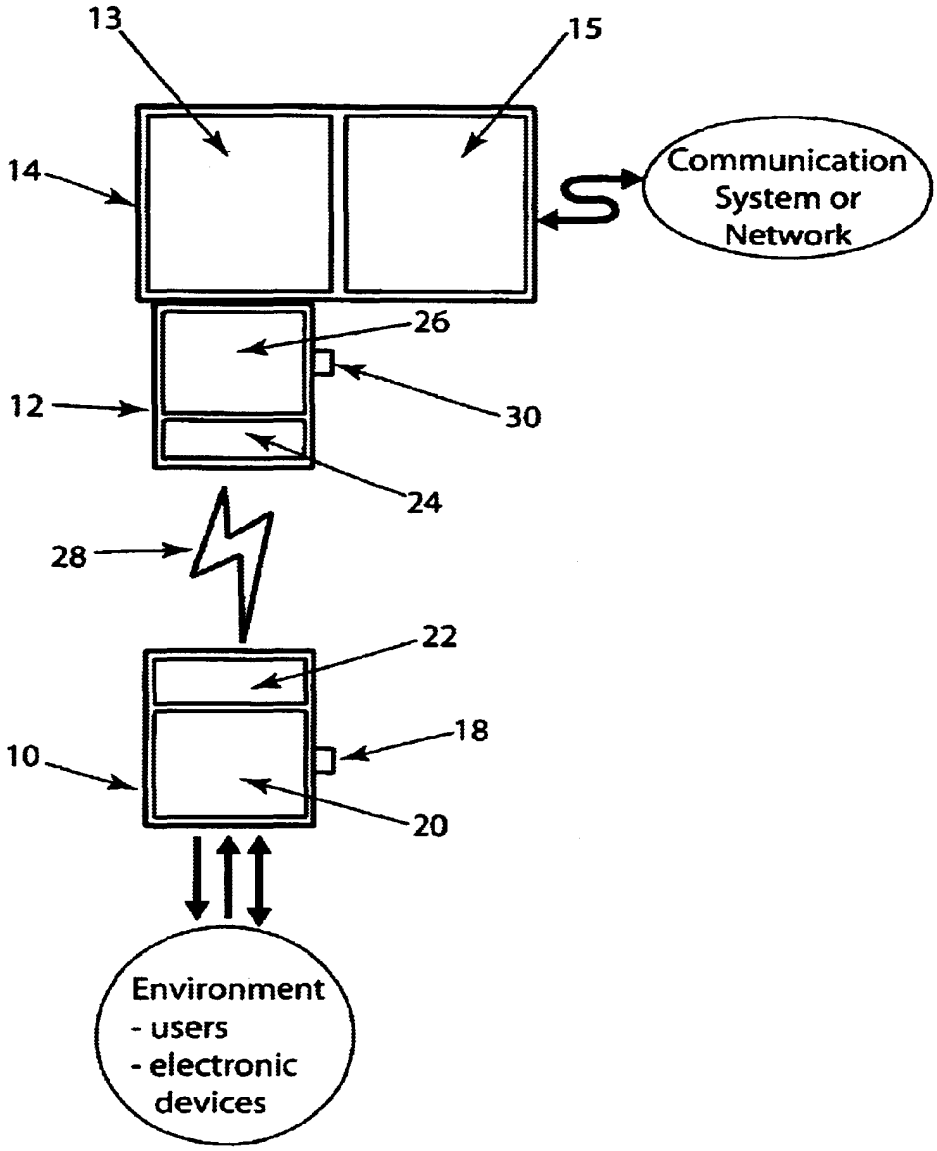

13
15
14
Communication System or Network
26
12
30
24
28
22
18
10
20
Environment
- users
- electronic devices

FIG. 2

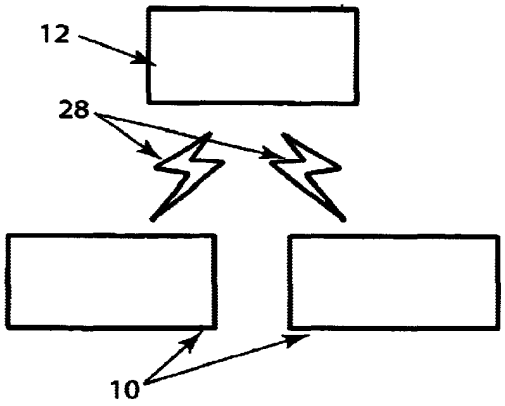


FIG. 3

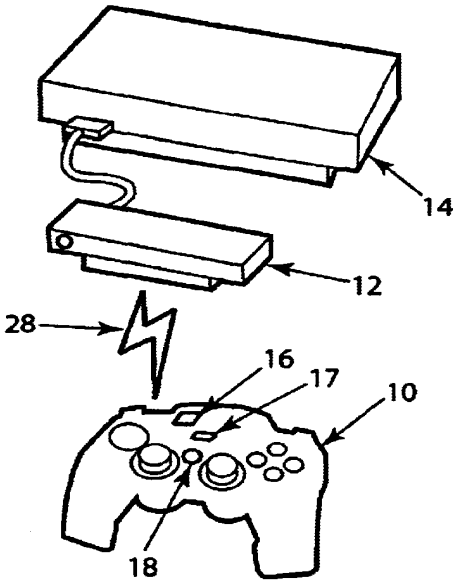
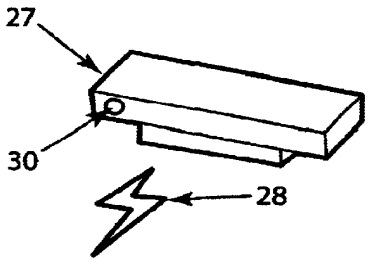


FIG. 4



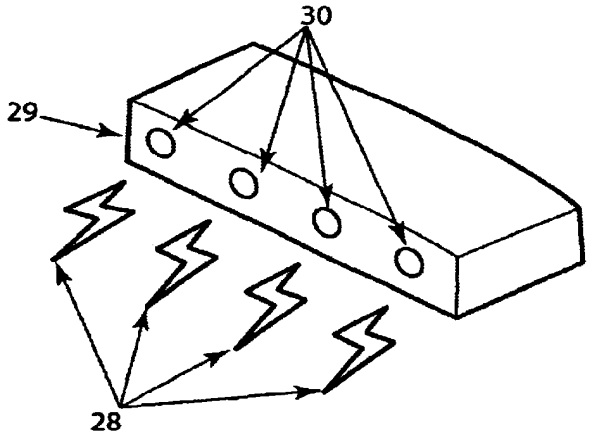


FIG. 5a

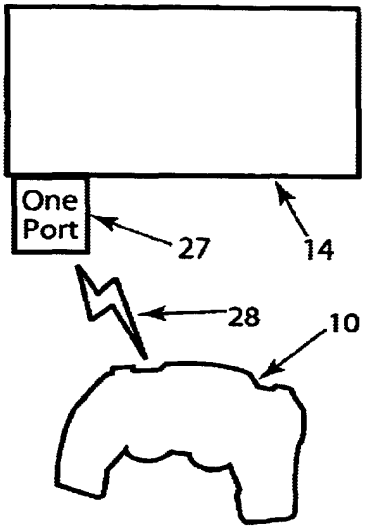


FIG. 5b

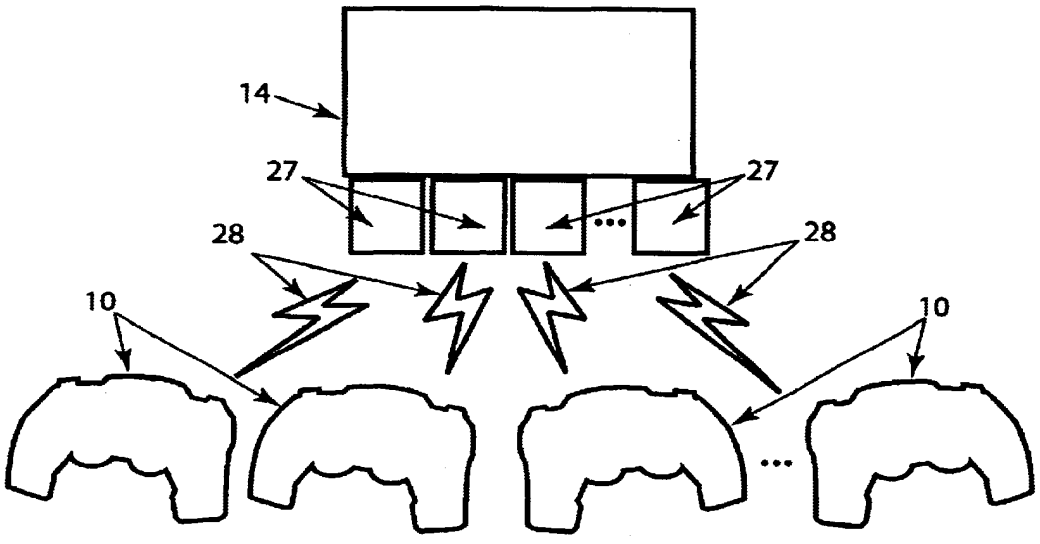


FIG. 6a

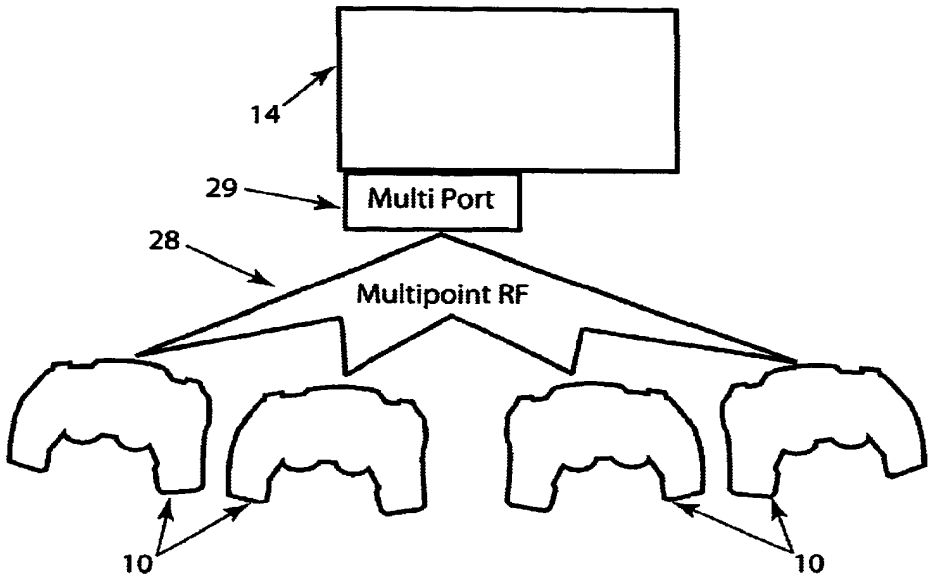

14
29
Multi Port
28
Multipoint RF
10
10

FIG. 6b

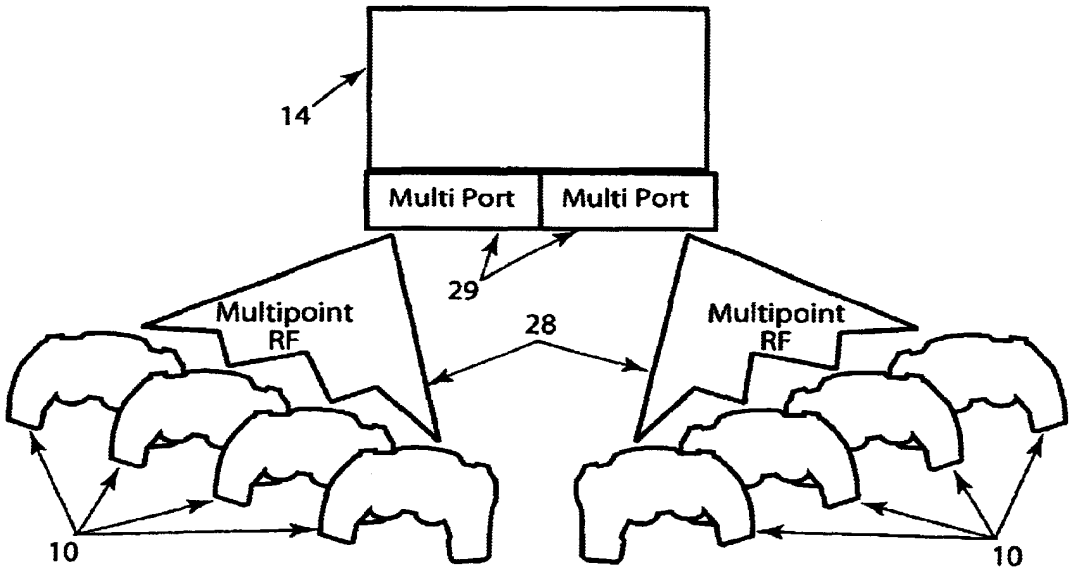

14
Multi Port
Multi Port
29
Multipoint RF
28
Multipoint RF
10
10

FIG. 7

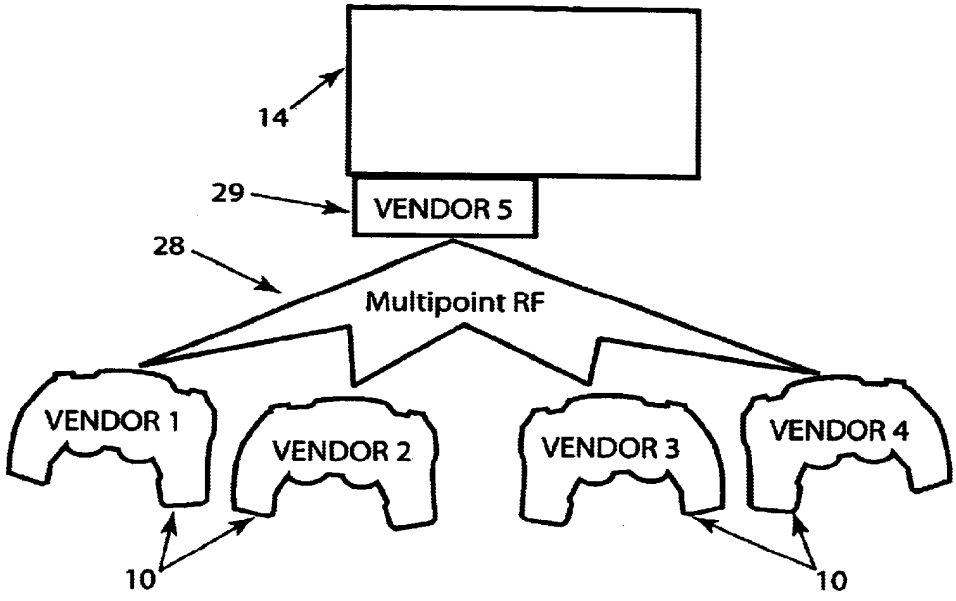

14
29
VENDOR 5
28
Multipoint RF
VENDOR 1
VENDOR 2
VENDOR 3
VENDOR 4
10
10

FIG. 8

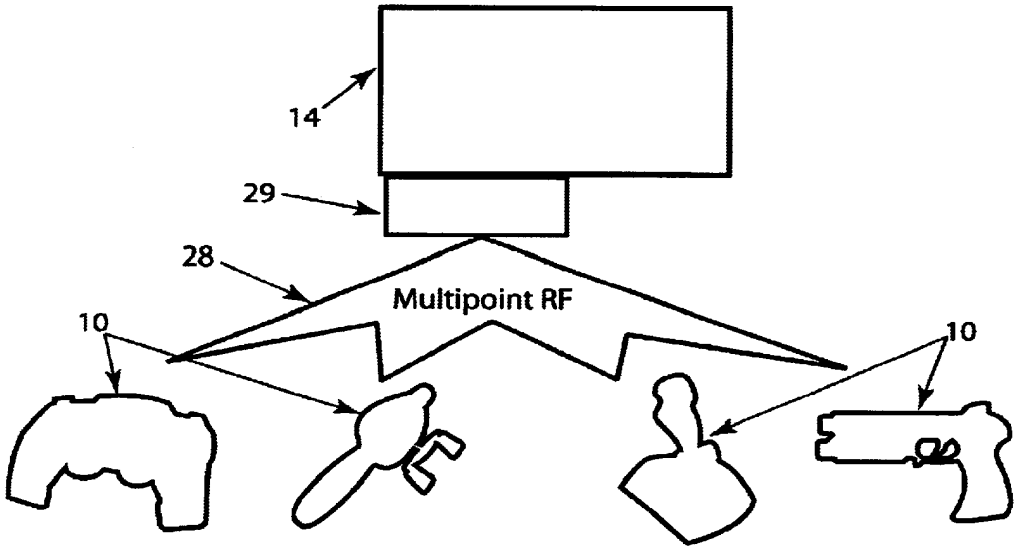

14
29
28
Multipoint RF
10
10

FIG. 9

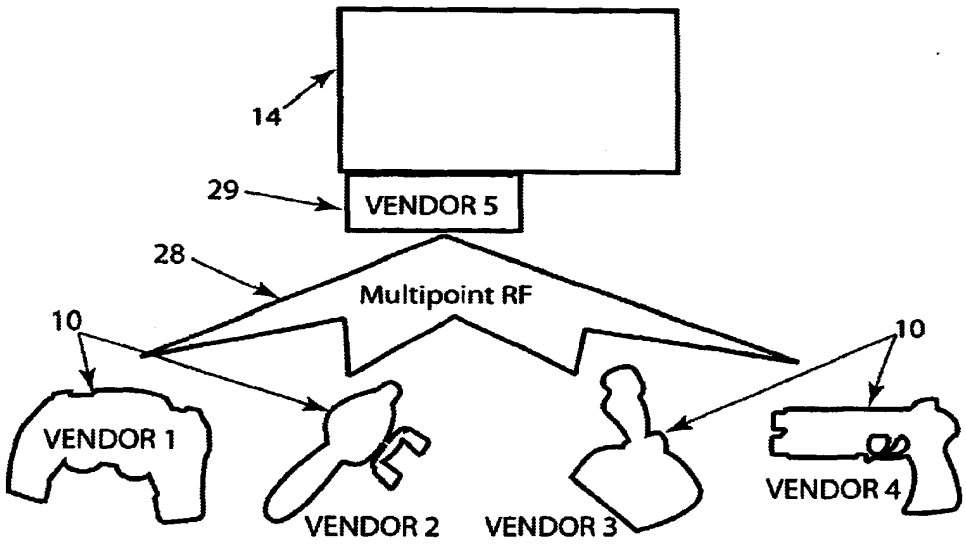

14
29
VENDOR 5
28
Multipoint RF
10
10
VENDOR 1
VENDOR 2
VENDOR 3
VENDOR 4

FIG. 10

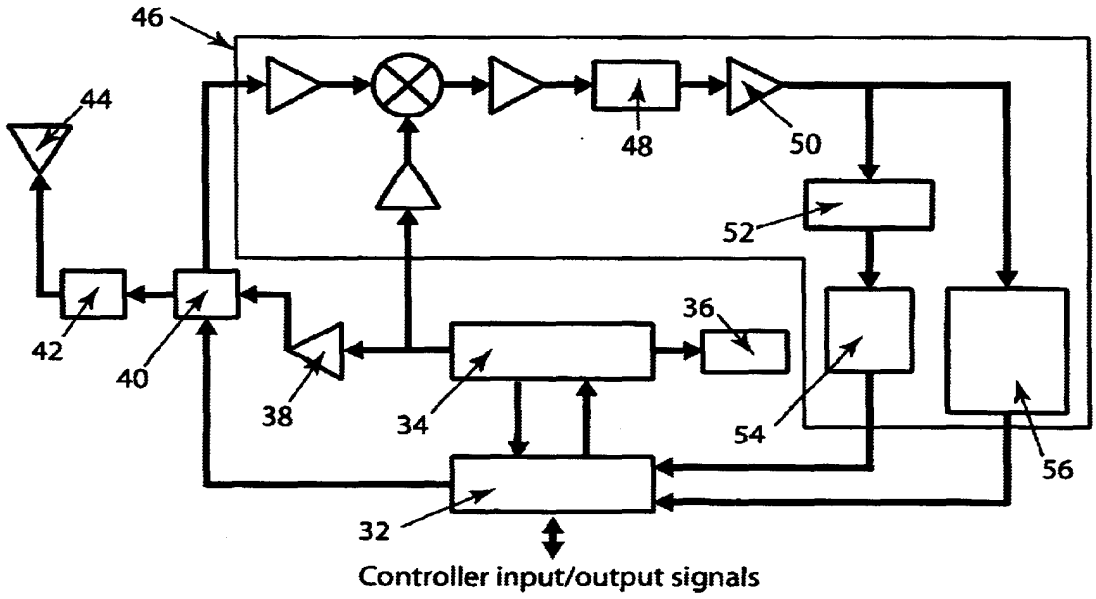

46
44
48
50
52
36
42
40
38
34
54
56
32
Controller input/output signals

FIG. 11

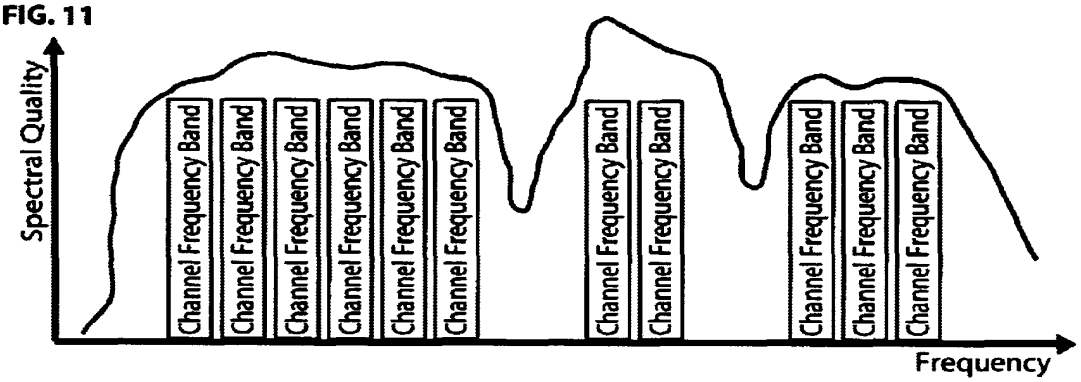


FIG. 12

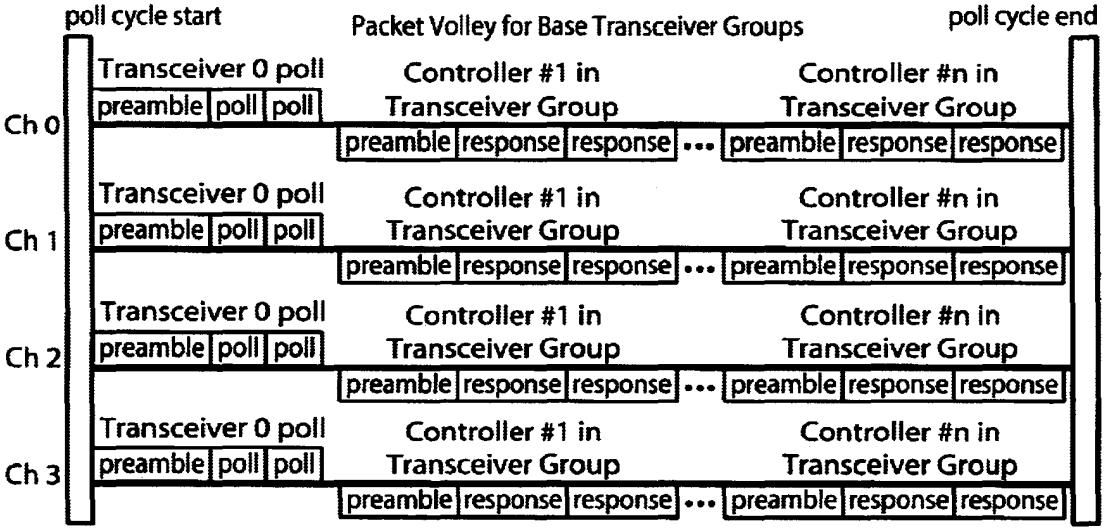


FIG. 13

TPPH Tranceiver Polling Packet Header
CPH#0 Controller #0 Polling Header
CPD#0 Controller #0 Polling Data
...
CPH#n Controller #n Polling Header
CPD#n Controller #n Polling Data
CRC Frame Check (CRC)

FIG. 14

CRH#n Controller #n Response to Poll Header
CRD#n Controller #n Response to Poll Data
CRC Frame Check (CRC)

WIRELESS GAME CONTROL SYSTEM

BACKGROUND OF THE INVENTION

The invention relates to the field of handheld video game controllers and wireless data transmission between the controllers and an electronic game device. More particularly, the invention relates to a low power wireless system integrating digital, analog, radio frequency (RF) and firmware devices to transmit control and data packets between different game controller devices and electronic game devices.

Electronic game programs operate on various electronic game devices. Electronic games use software and hardware devices to simulate game situations and experiences through visual, audio and mechanical stimuli. User interaction with these games is provided through a hand operated controller which permits the person to change the game direction or response and also to receive mechanical, audio or visual feedback from the game device. Many electronic games are fast moving and draw the user into fast moving responses which integrate the person into the game. Popular games require fast reflexive responses to the game situation and format and require the transmission of large data sets. Any interruption of such games is disruptive to the person's enjoyment and is highly undesirable.

Different competing vendors distribute multiple controller types incompatible with other game systems. Manufacturing companies plan system incompatibility to preclude operation of competing games on the system architecture. Conventional game controllers are typically hard wired to a hardware controller.

U.S. Pat. No. 5,451,053 to Garrido, (1995) described an electrical method for re-routing electric signals from a video game controller by a wired connection to a video game system. This system attempted to fit a fixed controller type to multiple games for a specific target video game system. U.S. Pat. No. 5,551,701 to Bouton et al. (1996) described a hard wire video game system with a fixed,controller configuration wherein the functions of the controllers can be reconfigured to suit an individual user's preference. U.S. Pat. No. 5,396,267 to Bouton et al., (1995) described a wired controller for game system configuration. U.S. Pat. No. 6,071,194 to Sanderson et al., (2000) described a hard wired controller wherein controller functions could be reconfigured to suit an individual user's preference and to match the supported functions to target game applications.

Wired controllers are capable of reliable and fast signal communication, however such controllers require wires leading from the controller to the electronic game device. Wires not only limit the operating mobility of the user relative to the electronic game device but they also present a safety hazard because they can be tripped over.

To avoid the disadvantages inherent in wired systems, certain game control systems transmit data signals using infrared ("IR") emitters and detectors. IR technology is conventionally used in remote control devices for televisions, stereos, and garage door openers. IR technology is undesirable for video game control because a moving person or pet can interrupt the communication link between the controller and the electronic game device. A controller using IR technology must be pointed directly at the receiver to maintain the communication link, and transmission can be easily interrupted by the normal movement of the user during game play. Additionally, IR transmission is susceptible to interference from other IR devices and from fluorescent lighting. Although IR light can be modulated, the number of effective communication channels within a single room is limited.

Various handheld game controllers have been developed. For example, U.S. Pat. Nos. 6,078,789 to Bodenmann et al. (2000) and 5,881,366 to Bodenmann et al. (1999) disclosed an RF wireless gaming system. The data transmission architecture in such systems was inherently limited and prevented additional signals from being transmitted after the system capacity was reached. Another wireless controller was disclosed in U.S. Pat. No. 5,605,505 to Han et al. (1997), which described a two controller infrared wireless system. The Han controller described a fixed controller to electronic game device pairing and was subject to the IR limitations described above.

In addition to IR transmission, other systems have attempted to use radio frequency ("RF") transmission in game environments. U.S. Pat. No. 4,531,740 to Green et al (1985) disclosed a remote controller system for a video computer game using RF transmission as a communication mechanism. The Green system was for a fixed, application specific controller and electronic game device configuration and did not provide for other uses. U.S. Pat. No. 5,806,849 to Rutkowski (1998) described a long range signal transmission system which depended on multiple channel transmission frequencies and used a single receiver to poll individual channels.

U.S. Pat. No. 5,618,045 to Kagan et al, (1997) described an all-to-all controller gaming network using an arbitrary wireless network (IR, RF or acoustic) and special purpose gaming controllers and did not support multiple types of controllers or electronic game devices. U.S. Pat. No. 6,001,014 to Ogata et al. (1999) described a controller and game system where bidirectional signals are transmitted via a wired interface. International Patent Number WO 99/59289 to Yamamoto et al. (1999) described a controller and game system where bidirectional signals are transmitted via a wired interface and where several wired controller types are supported.

Different data protocols have been developed to facilitate data transmission wirelessly. For example, Bluetooth Specification version 1.0B, an open standard promoted by the international Bluetooth Consortia, defines a short distance voice and data wireless data transfer system providing master/slave relationships, polling, frequency hopping and signaling.

SUMMARY OF THE INVENTION

The invention provides a modular architecture for short range, radio frequency wireless system for operating an electronic game device. The system comprises a base transceiver engaged with the game device, a controller for transmitting RF wireless signals to the base transceiver, wherein said controller has selected operating characteristics transmittable by the RF wireless signals, a microprocessor engaged with the base transceiver for receiving said RF wireless signals, wherein the microprocessor is capable of identifying the selected operating characteristics of the controller and of modifying operation in response to such selected operating characteristics.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates overall system components for an RF game control system.

FIG. **2** illustrates the master-slave relationship of base transceivers to controllers.

FIG. **3** illustrates a typical video game system physical implementation.

FIG. **4** illustrates a single RF port configuration and a multiple RF port configuration of the base transceiver.

FIG. **5***a* illustrates a single one port base transceiver and single controller configuration.

FIG. **5***b* illustrates a multiple one port base transceiver and multiple controller configuration.

FIG. **6***a* illustrates a single multi-port base transceiver and RF multi-point communication link to multiple controllers.

FIG. **6***b* illustrates multiple multi-port base transceivers and RF multi-point communication links to multiple controllers.

FIG. **7** illustrates a multi-vendor multi-port base transceiver and multi-vendor controller configuration.

FIG. **8** illustrates a single multi-port base transceiver with multiple controller types configuration.

FIG. **9** illustrates a multi-vendor multi-port base transceiver with multi-vendor multiple controller types configuration.

FIG. **10** illustrates a representative radio frequency system design.

FIG. **11** illustrates the selection of radio frequency channels in radio frequency spectrum bands having sufficient spectral quality to support signal transmission.

FIG. **12** illustrates a packet volley sequence between multiple base transceivers and multiple controllers.

FIG. **13** illustrates a poll packet format for gaming applications.

FIG. **14** illustrates a response packet format for gaming applications.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention provides a unique solution overcoming limitations of wireless IR game controllers. The invention provides a common framework to allow interoperation of multiple types of wireless controllers with multiple electronic game device types. Each game controller can be designed once and reused across multiple electronic game devices, and the gaming user can use their "favorite" controller for multiple game devices.

Referring to FIG. **1**, the system architecture generally comprises hand operated game controller **10**, base transceiver **12**, and electronic game device **14**. Although FIG. **1** illustrates an architecture for a game controller **10**, such architecture is applicable to other utilizations including computers, communications systems, and other devices. For wireless radio frequency transmissions, the system is arranged in a master-slave configuration, as shown in FIG. **2**, with base transceiver **12** acting as the master and controllers **10** acting as the slave. A typical commercial video game system implementation is illustrated in FIG. **3**, wherein controller **10** is linked through RF transmission with base transceiver **12** and electronic game device **14**. Controller **10** includes bond key **16**, program key **17**, and link status light **18** as further described below.

Controller **10** comprises a portable, hand operable remote component linked to electronic game device **14** through a radio frequency (RF) wireless connection. Controller **10** includes two subsystems defined as controller input/output subsystem **20** and controller RF module **22**. Controller input/output subsystem **20** comprises an interface between game device **14** and the user or an appended electronic device such as a game peripheral, plug-in expansion module, or data port to an electronic data device. Controller input/output subsystem **20** can comprise electronic devices to support one or more of: (i) digital and analog game control input keys and joysticks; (ii) audio input and output devices (speakers, microphones); (iii) video input and output devices; (iv) touch, position, movement and other environmental sensors, v) mechanical feedback devices such as vibrating motors; (vi) entertainment device control keys having various functions such as stop, play, pause, fast forward, reverse, TV, and VCR control functions; (vii) computer keyboards and touch pads with embedded processors, (viii) data interfaces; (ix) controller expansion modules; and (x) any number of similar interfaces for channeling environmental stimulus or input into the system and for providing feedback to the user or appended electronic device.

Controller RF module **22** manages the transmission of data between controller **10** and base transceiver **12**. As a visual indicator of RF link status controller RF module **22** contains a link-status light emitting diode ("LED") **18** used to show status information for a controller-to-base transceiver RF transmission channel.

Base transceiver **12** comprises a communication translation device. Base transceiver **12** comprises two subsystems defined as base transceiver RF module **24** and base transceiver host device interface **26**. Base transceiver RF module **24** receives or transmits data to and from controller RF module **22** in a one port configuration **27** using a virtual RF connection identified as RF port **28**. Base transceiver **12** also has a bonding light **30** which is used to show status information for individual controller-to-transceiver connections. Base transceiver RF module **24** may have a single RF port **28** per module in a one port configuration **27** or multiple RF ports **28** per module in a multi-port configuration **29** as shown in FIG. **4**. For single RF ports **28** a single channel frequency is used. For multiple RF ports **28** multiple linked controller signals are time multiplexed on a common channel frequency or in another embodiment on additional channel frequencies to increase overall capacity.

Base transceiver host interface **26** translates controller **10** commands into commands understood by connected electronic game device **14** and vice versa. The entire base transceiver **12** can comprise a physically separate device, can be plugged in to electronic game device **14** through a wire connection, or can be totally integrated into electronic game device **14**.

Electronic game device **14** comprises an electronic game device core system including the computer upon which a game program is hosted. Image display is provided by a television, computer monitor or similar display device. Electronic game device **14** is also responsible for coordinating the activities of integrated audio and video entertainment devices or communication devices **15** or for controlling the interfaces connected to external devices or networks. The audio and video subsystem consists of integrated consumer electronics such as DVDs, cameras and other devices. The communication subsystem can manage interfaces to external devices such as ethernet, USB or similar multiple purpose interfaces.

Although initial implementations of the system architecture are targeted to electronic gaming systems such as electronic game device **14**, it may also be extended by substituting electronic game device **14** with a compatible computer or communications device and by using a more generic data transmission component of the architecture

protocol. Wired connections can be replaced by wireless RF links and high level protocols required for computer or communications data transmission can be encapsulated in low level wireless data transport provided by the system architecture.

Many possible product configurations can be supported by the system architecture. The term "vendor" as used herein refers to a product designed and produced by an entity conventionally incompatible with products produced by other entities for market differentiation or other purposes. The following "gaming" configurations are representative combinations of one or more controllers **10** and base transceivers **12**.

1) Single Port Transceiver—Single Vendor

The system supports both single-player and multi-player scenarios, represented in FIGS. **5***a* and **5***b*, with single port base transceivers **27** each linked between game device **14** and each controller **10**.

2) Multiple Port Transceiver Operation—Single Vendor

The system supports both single-player and multi-player scenarios, represented in FIG. **6***a* with a multi-port base transceiver **29** and in FIG. **6***b* with multiple multi-port base transceivers **29**.

3) Multiple Vendors

FIG. **7** illustrates operation of a multi-port base transceiver **29** in communication with game controllers **10** provided by different vendors.

4) Multiple Type

FIG. **8** illustrates a mixed type environment supporting different types of controllers **10**.

5) Cross Platform

Architecture compliant controller devices created for one game system may be used with multi-port base transceivers **29** connected to a different game electronic device **14** as shown in FIG. **9**.

The utility of each controller **10** depends on what mappings of its input/output functions are possible for the target electronic game device **14** and resident electronic game software. The degree of compatibility will be determined by the overlap of functionality between the nonstandard controller and a standard controller for a given electronic game device **14**.

As shown in FIG. **10**, the RF system design is used in either controller RF module **22** or base transceiver RF module **24** to both transmit and receive signals and to detect signal strength. All operations of the RF section are under the control of a central microprocessor **32**. Although a frequency shift keying (FSK) modulation technique is described, other modulation and encoding techniques could also be used.

Microprocessor **32** controls modulator **34** and oscillator **36** to generate a transmit frequency shift key signal. The signal is amplified with amplifier **38** and is controlled by RF switch **40** which controls the half duplex signal transmission. During transmission RF switch **40** allows the transmit signal to pass out of the system through bandpass filter **42** and antenna **44**. Bandpass filter **42** is used at the output prior to antenna **44** for harmonic suppression and image frequency removal.

When a signal is received, RF switch **40** allows the signal to pass into receive section **46**. Using super heterodyne techniques, the signal is reduced to an intermediate frequency (IF) where filter **48** removes adjacent channel frequencies. Next the signal is amplified with amplifier **50** and passed through demodulator **52**. The digital signal is then extracted using a post detection filter and data slicer circuit **54** and is sent to microprocessor **32**.

Also shown in the diagram is a received signal strength indicator (RSSI) **56** used by microprocessor **32** both to determine the received signal strength (for power control) and to act as a RF carrier detect to sense when a new RF transmission has been originated. The receive power is compared against the standard and this information is passed up to the next protocol layer where packet fields are used to carry power level information to dynamically adjust power levels of transmitting devices. Transmission frequencies are organized by channels. Each RF system uses a group of channels called "palettes" for transmission purposes. Channels in channel palettes are automatically replaced if one of the channels in a palette becomes bad. The circuitry of RSSI **56** can help determine if a channel is going out of tolerable transmission specifications.

Data is transferred over the RF Ports **28** between base transceiver **12** and controller **10** pairs using a synchronized polling process. To avoid transmission signals from adjacent base transceivers **12** saturating a non-transmitting transceiver **12**, the polling process is also synchronized across multiple transceivers **12** (see FIGS. **5***b* and **6***b* for multiple transceiver examples). This is achieved by base transceivers **12** and controllers **10** listening to transactions of adjacent base transceivers **12**, by a designated primary base transceiver **12** broadcasting a synchronization signal periodically, or by use of similar detection and coordination method. Between synchronization events, each of the controller RF modules **22** and base transceiver modules **24** use internal clock oscillators to maintain polling synchronization.

The invention provides unique RF control over game operation by using the radio frequency system physical components such as controller RF module **22** and base transceiver RF module **24** together with bit transmission and connection methods ("bonding") and the electronics associated with providing the controller functions and the base transceiver functions.

Controller I/O subsystem **20** supports base functions and may be expanded to include other types of mechanical, audio, video and data functions in addition to the following:

- analog and digital keys and joysticks
- backhaul—support for multiple vibration, force, audio, and feedback devices
- Joysticks—support for multiple analog joysticks each w/tactile switch
- Analog Support—four joystick axes and twelve pressure-sensitive keys and spares.
- Programmable features such as auto repeat and remapping of controller input functions (e.g. keys function remapping).
- entertainment remote controls—e.g. DVD/CD, TV controls.

The RF signal specification preferably operates in a range between 905 and 928 MHz, and the frequency spectrum is broken into up to forty concurrent channels or more. Although this is the initial frequency range supported, all techniques and features described are equally applicable in other frequency ranges of sufficient spectral width or in ranges where the number of channels is changed to fit the available spectrum.

The center frequencies of channels are selected dynamically and updated continuously for optimal low noise and acceptable signal transmission performance across the allowable transmission spectrum. Center frequencies are not necessarily evenly spaced given they are optimized for best transmission performance, but maintain a minimum spacing to avoid channel spectral overlap as illustrated in FIG. **11**.

Each base transceiver **12** selects a starting "channel palette" of up to four or more channel frequencies. Such selection is coordinated with the channel frequencies of other base transceivers **12** and controllers **10** which are in range. During initial palette set up, the base transceiver **12** and associated controller **10** both scan the available frequency band and listen for radio frequency energy levels using their RSSI **56** feature. The palette center frequencies are selected from areas of low radio interference (high signal quality) as measured from both base transceiver **12** and controller **10**.

As a given base transceiver **12** transmits, it can select and cycle through palette frequencies in a coordinated fashion with its associated controllers ("frequency hopping"). Alternatively, base transceiver **12** may use any of the channel frequencies in its palette in a static fashion and only change to other channels if the static channel becomes unusable. The system automatically finds replacement channel frequencies if one of the channels in its pallette becomes bad. CRC error checking (from a higher level layer in the system), RSSI **56** signal measurements and other methods (such as calculated distortion metrics) are used to determine channel quality.

Multiple controllers **10** are operable by a given electronic game device in an immediate area without interfering with each other. Each channel carries data in both directions using a duplex transmission method.

The RF carrier can be modulated using FSK (Frequency Shift Keying) and encoded using bit randomization or other technique for DC offset minimization and other desirable characteristics. The system has a base data rate of 57.6 kbps with extensions to beyond 1500 kbps. More sophisticated and frequency efficient modulation and encoding techniques can also be used for higher bit efficiency and when other design specific transmission quality, signal power, bit-error or bit-rate attributes are required (e.g. QAM, QPSK, spread spectrum etc.)

The maximum output power of the controller is preferably negative 2 dBm or positive 650 microwatts, but this may vary depending on the modulation and encoding techniques and operating frequency ranges selected. The system operates at low transmission power to fit within FCC Part **15** (USA) and RSS **210** (Canada) regulations for Low Power Unlicensed Devices. The system has a basic transmission range of 10 meters with extensions to 25 meters or beyond with commensurately higher bit error rates and/or power level. The controller **10** and base transceiver **12** antennas such as antenna **44** are typically entirely enclosed because of the frequency range chosen. Such antennas are realized on the relevant printed circuit boards (PCB) as a microstrip antenna or by a short mechanical antenna structure.

The properties of the RF circuitry utilized by controller **10** and base receiver **12** impact the design of an appropriate bit-level transmission protocol. The RF protocol should:

- reliably transport status information from controllers **10** and base transceivers **12**;
- minimize signalling latency;
- allocate and manage a set of RF channels using both frequency division and time division multiplexing;
- detect packet errors and initiate appropriate recovery actions; and
- scan for and circumvent noisy segments (including intermittent noise) of the frequency band.

As shown in FIG. **12**, base transceivers **12** poll their associated controllers **10** nearly simultaneously. Following the packet volley, base transceivers **12** listen for their associated controller responses on their individual channels. Poll and response packets to each controller **10** for a given base transceiver **12** are time division multiplexed. Since each volley from each base transceiver **12** is on a different channel frequency, the polling process for all connected groups of controllers **10** can occur in parallel. Both poll packets and response packets can be transmitted in pairs (optional) to increase the reliability of the radio link. The packet preamble conditions the system electronics to prepare for data transmission.

The invention uniquely provides for dynamic bonding of each controller **10** with an associated base transceiver **12**. "Bonding" is a process by which controllers **10** are wirelessly linked to a given base transceiver **12** and the system learns the capabilities of a new controller **10**. The bonding process is divided into three steps. First, controller **10** finds an available RF port **28** on base transceiver **12** and a controller address is sent to base transceiver **12** to save this association. Second, base transceiver **12** provides the available channel palette information to controller **10** and potentially adjusts its palette by changing one or more palette frequencies if transmission to new controller **10** is impaired on one or more of the channel palette frequencies. Finally, in a "feature negotiation" step, the capabilities of controller **10** are shared with base transceiver **12** which adapts controller **10** data signals to most closely match the characteristics of the electronic game device **14**. Feature negotiation is performed in the adaptation layer.

Controllers **10** and base transceivers **12** are "dynamically bonded" when controller **10** powers up and whenever the bonding key **16** located on controller **10** is operated by a user. Base transceiver **12** keeps a record of its last mated controller or controllers **10** and will bond to that controller **10** first if more than one controller **10** is available during such search.

As a visual bonding indicator, bonding light or lights **30** such as forward facing colored LEDs are built into base transceivers **12**. When a base transceiver **12** bonds to a controller **10**, base transceiver **12** emits a one second burst of light at 10 Hz. During such initial bonding "burst", the link-status light **18** on controller **10** mimics bonding light **30** on the matching base transceiver **12** port, also with a one second burst at 10 Hz. At all other times link-status light **18** provides a visual indication of link quality by representing channel signal quality and signal presence by making an on-duration or brightness proportional to the percentage of good data transfers between controller **10** and base transceiver **12**. Each bonding light **30** has two basic purposes—to indicate that bonding has successfully happened and to indicate to which RF port **28** controller **10** has bonded.

Operation of bonding key **16** rejects the currently bonded RF port **28**, causing another RF port **28** to bond with controller **10**. Holding down the bonding key **16** causes controller **10** to toggle through all available RF ports **28**, with each RF port **28** bursting the corresponding bonding light **30** when a successful bond has occurred. The user releases bonding key **16** when the controller **10** has bonded with the desired RF port **28**.

An adaptation layer acts as an intermediary between the application and RF layers. The adaptation layer handles the feature negotiation step of dynamic bonding and data packetization such as translation, compression, or data verification. When a new controller **10** is bonded to the system it must inform the system about its capabilities so base transceiver **12** can translate and match signals passing between electronic game device **14** and the new controller **10**. This step of dynamic bonding is referred to herein as "feature negotiation". This capability of the invention permits each

controller **10** to be manufactured by the same manufacturer of the electronic game device **14** or to be manufactured by another manufacturer. Similarly a new controller **10** from another electronic game device can be used with electronic game device **14** and the functions of the new controller **10** can be mapped to support the games resident on the new electronic game device. In yet another case, each controller **10** may be of a new type.

Feature negotiation can be achieved using one or a combination of techniques such as:

1) Standard codes and profiles representing classes of controller **10** and host types where key and input functions are clearly defined and can be passed from controller **10** to base transceiver **12** to establish a standard default configuration;
2) A "body mapping" convention can be used where the fingers on the hands and selected body areas (e.g. head, chest, shoulder, elbow, knee, ankle, eye, mouth etc.) are mapped to functions on the selected controller **10** and these functions are mapped to the functions required for a given electronic game device **14**. In this way basic game controller functions are the same or similar, regardless of which electronic game device **14** the person desires to use. This greatly reduces the learning curve when using controllers **10** on multiple electronic game devices **14**. Information about the "body mapping" is transferred to base transceiver **12** so it can perform a standard input device mapping for the target electronic game device **14**; and
3) Using a controller programming key or an application-based graphical user interface, the controller button inputs can be remapped by the user to suit the target electronic game application.

If during the function mapping process whenever a given RF channel is nearing its data carrying capacity and the addition of features from a newly introduced controller **10** threatens to exceed that capacity, additional feature negotiation occurs between those controllers **10** connected to a given base transceiver **12**. The base transceiver **12** needs to either downgrade feature support for the added controller **10** or reduce feature support across multiple controllers **10**. This process is coordinated by base transceiver **12** working in conjunction with its associated controllers **10**.

Within each polling cycle base transceiver **12** sends a poll packet and controllers **10** will respond with response packets as shown in FIG. **12**. The adaptation layer defines the format, of these packets. Packet formats and types may be extended or modified to support different electronic game devices **14**, different controllers **10**, data transmission modes or other applications.

The poll packet, as shown in FIG. **13**, is sent by base transceiver **12** to initiate the polling volley. Since the poll packet is sent once per packet volley it contains information relating to each of the associated controllers. Within each polling cycle each controller **10** will send a response packet as shown in FIG. **14**. The poll packet has several components:

TPPH—Transceiver Polling Packet Header

The TPPH is the overall header for the polling packet. It contains packet type, polling control (e.g. flow control, redundant packet flag) and base transceiver address, other channel address information. It may contain other application dependent fields for other data and protocol control purposes.

CPH#n—Controller #n Polling Header

The CPH is a sub-header in the polling packet. Each controller **10** being addressed by base transceiver **12** preferably has a separate CPH and CPD component containing data type, data address, and data control (e.g. quality of service, size) information and RF link control (e.g. transmit and receive power level fields to adjust power levels dynamically) information.

CPD#n—Controller #n Polling Data payload

Each controller **10** associated with a base transceiver **12** is sent information relating to the particular application. Gaming and generic data payload characteristics are described below.

CRC—Cyclic Redundancy Checking

The data packet is protected with a CRC-16 (or better) frame check (x16+x12+x5+1).

The response packets from each individual controller **10** have several components:

CRH#n—Controller #n Response to Poll Header

The CRH is a header for the controller **10** response to a base transceiver **12** poll packet. Each controller **10** must send a response to the poll request made by base transceiver **12** containing data type, data address, and data control (e.g. quality of service, size) information and RF link control (e.g. transmit and receive power level fields to adjust power levels dynamically) information.

CRD#n—Controller #n Response to Poll Data payload

Each controller **10** sends data to its associated base transceiver **12** using this field. Gaming and generic data payload characteristics are described below.

CRC—Cyclic Redundancy Checking

The data packet is protected with a CRC-16 (or better) frame check (x16+x12+x5+1).

Game data payloads can be divided into feedback signals coming from electronic game device **14** to controller **10**, such as controller motor signals carried by the CPD field of the poll packet. Input signals coming from controller **10** to electronic game device **14** are carried in the CRD field of the response to poll packet.

If sufficient RF wireless transmission capacity exists, the analog information relating to motor control, joystick position, button pressure or other analog input device can be represented directly up to the resolution of the analog to digital converter or can be compressed using vector quantization where the amount of data exceeds the data capacity of the RF channel. For example, the high-speed motor control could be represented by 8 bits uncompressed data or dynamically compressed to 2 bits, while the low-speed motor control might be 10 bits uncompressed or compressed to 6 bits as required.

Digital button information is represented by a binary button vector. For twelve digital buttons on controller **10** this vector is typically twelve bits long. Additional bits may be allocated per digital input device depending on its attributes.

As the number of active analog buttons rises, button resolution gradually decreases from 6 bits/button down to as low as 3 bits/button. For the base implementation, analog bandwidth is fixed at 56 bits per response packet, but this might be increased or decreased as driven by the data requirements of the target set of controllers to be supported by the architecture. Analog button data is transmitted in the same order as the corresponding binary button-vector bits. The type of data representation varies by analog input type e.g. a simple analog button is represented by a simple bit sequence, whereas an analog joystick is represented by x and y coordinate information. When fewer than 5 analog buttons are active, the unused fields are ignored.

Generic data transfer can be used for transferring game-related data, for updating controller firmware, or for general computer and communications applications. Higher level

protocols (e.g. TCP/IP) utilized for gaming, computer, communications and other applications are encapsulated in the data payload. The data payload is of variable length to accommodate applications with variable length data unit requirements and additional control and protocol parameters. Data packets can be interspersed with game packets or transmitted when game packets are not being sent (e.g. between games) or can exist separately (e.g. data only applications).

Within the data payload, additional control and protocol parameters (one byte or more) may be embedded to further extend capabilities of data transmission such as sequence numbers, additional embedded protocols and mediation layers. The size of the parameter portion of the payload depends on which features are supported for the given data packet type. The number of bytes in a packet depends on the payload size settings found in the controller header (CPH or CRH) and is bounded by the transmission rate possible by the system. The faster the transmission rate, the more bytes per polling cycle can be accommodated.

An application layer controls high level functions relating to external world interfaces and system-wide functions. The application layer manages the controller input/output subsystem in the controller and mediation of signals between the base transceiver and the electronic game device.

Controller I/O subsystem **20** polls various controller input devices such as analog and digital keys, joysticks, other external interfaces, for user or external input and transmits the results to base transceiver **12** for use by electronic game device **14**. The subsystem also receives information from electronic game device **14** to provide feedback to the user or external devices such as motor control, control and data signals to external devices.

User programming features of functions such as remapped key functions and macros to repeat key sequences automatically are also supported by this controller I/O subsystem **20**. Any of the triggers, control keys or other input interface supported by the controller I/O subsystem **20** electronics may be put into or removed from an "auto repeat" mode using the "program" key **17** as shown in FIG. **3**. When auto repeat is enabled on a key, the pressed key will automatically repeat at 10 Hz when operated by the user.

Any compatible input devices may be remapped to one another or swapped using a hold and release sequence of "program" and trigger and/or controller keys. For example analog keys sensing and converting pressure into a multi-level digital signal may be remapped to joysticks and conversely. The sensitivity of analog keys may also be adjusted and the vibration mode of controller motors selected by controller **10**.

All user programming features are set to defaults values at power-on, but the last five or more programmed configurations ("save sets") are stored in non-volatile memory and may be recalled by the user. The first of these "save sets" is stored automatically, additional "save sets" may be stored manually up to the memory capacity of the controller.

Entertainment system functions built into the electronic game device are controlled by remapping the existing controller keys or in the case of a stand-alone special purpose entertainment wireless RF remote controller by using a subset of the defined button fields in the game protocol payload definition. If wireless RF remote controller **10** has more buttons than supported by the basic game controller, a data-oriented packet method may be used or additional gaming-related fields may be defined.

Base transceiver **12** mediates and converts signals between controller **10** and electronic game device **14** to ensure compatibility. Base transceiver **12** also can control the sub-functions of bonding new controllers **10** to base transceivers **12** and the associated mapping of new controller types to new or existing electronic game devices **14**.

Electronic gaming devices can include integrated entertainment and communication features such as DVD, internet connectivity, telephony, and video conferencing. Controller **10** can incorporate various entertainment control, communication control and data capabilities suitable for providing ethernet interface, portals for internet appliances, personal digital assistance, and audio, tactile and visual interfaces such as microphones, speakers, video displays, video cameras, data ports, and VR-virtual reality devices.

Because wireless gaming controllers provide increasingly diverse and sophisticated functionality, the wireless controller architecture provided by the invention coordinates and supports differing controllers **10** as an interface with differing electronic game devices **14**. The invention allows interoperation of any game controller **10** with any electronic game device **14** by means of a common layered protocol which mediates data connections and the content/presentation format of the data structure. The data format from a given controller **10** may need to be modified to be correctly interpreted by a given electronic game device. The reconfiguration is automatic in nature via a feature negotiation process and is adaptable to many more configurations permutations on many different types of controllers and on many different types of electronic game devices without using a mechanical switching cartridge for each game permutation. The invention adapts a signal on both the controller **10** and base transceiver **12** end of the game controller connection and provides for more generic controller input/output configurations. The invention can support multiple controllers and contains innovations unique to the wireless gaming environment such as channel palettes, synchronization, and bonding. The invention provides a feature negotiation process which allows the system to adapt to new controller types and multi-controller configurations, for multiple hosts and multiple base transceivers and multiple electronic game device types. It also provides synchronization between base transceivers, simultaneous polling volleys, and mediation for different electronic game device types.

The invention also supports controller input/output functions and programming capabilities and interfacing between the controller and an electronic game device with the following characteristics:

1) low packet transmission latency with stringent real time performance;
2) noise characterization and circumvention;
3) error detection protocols;
4) low overhead, low cost, and low power consumption;
5) clear channel seeking, frequency hopping;
6) multiple function controller support;
7) multiple vendor/cross-platform controller and electronic game device support;
8) multiple point base transceiver to multiple controllers support;
9) support for dynamically bonding controllers to base transceivers with a built in feature negotiation step to allow the base transceiver to learn controller attributes; and
10) multiple layer (RF (physical), adaptation, and application) system, allowing new features to be easily introduced on a per layer basis without interfering with features of other layers.

In different embodiments of the invention, the controller and base transceiver can share a common address transmitted as one of the signals. The system can support multipoint RF wireless communications between a base transceiver and subtended controllers where such base transceivers and controllers can be of multiple types and can dynamically bond with and negotiate to determine supported capabilities. The system can include a layered architecture that ensures compatibility between linked controller and electronic game devices through a protocol independent of both the controller and the electronic game device, and the layered framework can ensure compatability between a linked controller and electronic game device through a protocol independent of both the controller and the electronic game device. The system can comprise first and second controllers each transmitting RF wireless signals respectively to first and second base transceivers, and each microprocessor in each first and second base transceivers can dynamically synchronize first and second base transceiver inter-transceiver and controller-to-transceiver transmission events. The controller and base transceiver and electronic game device are supportable with game-related data and firmware updates.

Although the invention has been described in terms of certain preferred embodiments, it will be apparent to those of ordinary skill in the art that modifications and improvements can be made to the inventive concepts herein without departing from the scope of the invention. The embodiments shown herein are merely illustrative of the inventive concepts and should not be interpreted as limiting the scope of the invention.

What is claimed is:

1. A wireless system for video game control comprised of a base transceiver engaged with an electronic game device where:

the base transceiver communicates wirelessly with one or more wireless controllers concurrently;

the controllers are capable of translating user input into digitally coded data and sending this data to the base transceiver;

the base transceiver is capable of relaying the data received from the controllers to the electronic game device thus allowing the users to remotely control the electronic game device;

the wireless communication can be bidirectional to allow feedback information to be delivered from the electronic game device to the controllers;

the bi-directional wireless communication, when present, can be either half duplex or full duplex;

the base transceiver selects a channel palette of one or more channels to be used for wireless communication between the base transceiver and all controllers;

the channel palette constitutes the collection of channels that the system uses to implement a frequency hopping pattern if more than one channel exists in the channel palette;

the base transceiver and the controllers each check the integrity of all received packets using a checksum method and maintain a ratio of good versus damaged packets to characterize the quality of each channel;

the base transceiver and the controllers each monitor the received signal strength of incoming packets to help identify poor channels;

the base transceiver or the controllers or both collect and store RF channel performance data such as signal strength and channel quality;

the controllers can send said stored RF channel performance data to the base transceiver;

the base transceiver can adjust the channel palette to replace bad channels with better channels which it finds by periodically trying new channels, and by analyzing and interpreting its own measured channel performance data, or channel performance data received from the controllers, or both;

the base transceiver can adjust the number of channels in the channel palette as the number of available good channels varies;

the channel palette adjustments can be used to dynamically optimize communication reliability by avoiding the use of bad channels suffering from interference, obstacle attenuation, multipath nulls, other problems, or any combination of these problems;

the base transceiver uses synchronous time domain multiplexing techniques to communicate with each controller by specifying a synchronous time slot during which each controller can communicate with the base transceiver;

the frequency hopping and synchronous time domain multiplexing techniques are used in conjunction with one another to help ensure that packets are received intact on the first attempt thus circumventing the need to retransmit damaged packets and thereby achieving a small system latency with a small standard deviation and therefore minimizing the user's perceived control lag;

the controllers can use the synchronous time domain multiplexing to save power by turning off their radio transceivers when they are not receiving or transmitting data;

the base transceiver can use the synchronous time domain multiplexing to save power by turning off its radio transceiver when it is not receiving or transmitting data.

2. A system as in claim **1** which supports multiple base transceivers which communicate between each other and coordinate the use of channels and timeslots so as to not cause interference with one another and where:

coordination is employed to ensure that no two devices will transmit on the same channel at the same time, and;

the receiver swamping problem is circumvented by synchronizing the time domain multiplexing cycle of each base transceiver so that they all transmit at the same time.

3. A system as in claim **2** which is capable of having each controller dynamically bond to any one of a variety of different base transceivers at any given time and where each controller incorporates controls that, in a multi-base transceiver environment, enable it to select which base transceiver it is bonded with.

4. A system as in claim **1** where the system is further capable of having each controller dynamically bond to any one port on a base transceiver at any given time and where:

the address information that creates the logical link between controller and base transceiver is dynamically generated and shared between the two devices via a radio transmission so that the user does not have to mate a controller to a base transceiver by manually setting addresses;

the base transceiver has one or more logical wireless ports and the controller incorporates controls for selecting which of these ports the control device is bonded to and where said logical ports can be mapped by the base

transceiver onto electronic game device control ports corresponding to player **1**, player **2** and so forth;

bond indicators on the base transceiver or controllers or both provide a visual indication to the user regarding which logical port on that base transceiver each controller is bonded with.

5. A system as in claim **1** where in order to further improve reliability while maintaining low latency, wireless data is sent using direct sequence spread spectrum techniques which enables the receiving side to correct bit errors caused by communication problems.

6. A system as in claim **1** where in order to further improve reliability while maintaining low latency, the base transceiver implements an antenna that receives and transmits radio signals in a plurality of polarizations to maintain a consistently high radio frequency signal margin regardless of the physical orientation of each controller.

7. A system as in claim **1** where in order to further improve reliability while maintaining low latency, the base transceiver or controllers or both are implemented using a processor or microcontroller incorporating multiple hardware threads to ensure predictable handling of real time events.

8. A system as in claim **1** where the base transceiver is either a device that is externally connected to the electronic game device or a module that is built into the electronic game device, computer system, television or other appliance.

9. A system as in claim **1** where the base transceiver is implemented with a single radio transceiver to communicate with one or more controllers.

10. A system as in claim **1** where in order to further reduce latency, the synchronous time domain multiplexing of said wireless game control system is synchronized with the polling cycle of the electronic game device that is engaged with the base transceiver.

11. A system as in claim **1** that allows for the upgrade of the firmware of the controllers by downloading the new firmware from the base transceiver via the RF wireless link and where the firmware upgrade can be made available to the base transceiver via plug in media or by the engaged electronic game device which in turn can receive it from a memory card device, game media such as a cartridge or compact disk, or a connection to the internet.

12. A system as in claim **1** that allows for the upgrade of the firmware of the controllers by downloading the new firmware from a hardware expansion module or upgrade port physically located on the controller.

13. A radio frequency wireless system for remote operation of an electronic game device where:

the system is comprised of two types of devices:

a base transceiver comprised of two distinct sub-systems where one provides an interface to an engaged electronic game device and the other provides a radio frequency communication interface to one or more wireless remote controllers;

one or more wireless controllers each comprised of two distinct sub-systems where one provides a user interface to accept input from and deliver feedback to a user and the other provides a radio frequency communication interface to said base transceiver;

the system is designed to enable cross platform compatibility where:

any given controller can bond to any base transceiver and provide seamless functionality of commonly supported features where each base transceiver may be designed to interface to a unique brand or model of electronic game device;

any given base transceiver can bond to any controller and provide seamless functionality of commonly supported features where each controller may be designed with a unique user interface or a unique physical layout of user interface elements;

each base transceiver contains a set of digitally stored records consisting of one record for each input sensor that said engaged electronic game device is capable of receiving data for and another set of digitally stored records containing one record for each user feedback mechanism that said electronic game device is capable of sending control data for;

each controller contains a set of digitally stored records consisting of one record for each input sensor that said controller has and another set of digitally stored records containing one record for each user feedback mechanism that said controller has;

each record contains information about the associated input sensor or user feedback mechanism including the type of the sensor or mechanism and the number of data bits associated with the sensor or mechanism;

each base transceiver and each controller are capable of negotiating a common set of user input sensors and user feedback mechanisms by identifying matching records;

the record matching is performed in a number of passes starting with very strict matching requirements and with subsequent passes being performed on the remaining unmatched records using less strict matching criteria in an attempt to match all fields;

translation information is generated from the results of the record matching process to describe how the data described by one record should be manipulated to make it conform to the data format required by the matched record;

the translation information can include such details as sign conversions, logic conversions, and data resolution scaling instructions;

each controller is capable of using the generated translation information to structure data packets containing data obtained from its input sensors and manipulated to be compatible with the data types acceptable to the electronic game device engaged with the base transceiver;

each controller is capable of sending said manipulated data packets using radio wireless communication to the base transceiver to which it is bonded which in turn delivers them to the engaged electronic game device as though they had been delivered from a physically attached wired video game controller so as to control or manipulate the game;

each base transceiver is capable of using the generated translation information to structure data packets containing data obtained from the engaged electronic game device and manipulated to be compatible with the data types acceptable to the feedback mechanisms on the controller to which it is addressed;

each base transceiver is capable of sending the manipulated data packets using radio wireless communication to the controller to which they are addressed which in turn uses them to control the user feedback mechanisms of the controller as though they were wired to and being directly controlled by the electronic game device.

14. A system as in claim **13** wherein the digitally stored records also contain body mapping information used to identify which part of the user's body is intended to actuate

the input sensor or receive feedback from the associated feedback mechanism.

15. A system as in claim **14** that allows for the upgrade of the firmware of the controllers by downloading the new firmware from the base transceiver via the RF wireless link and where the firmware upgrade can be made available to the base transceiver via plug in media or by the engaged electronic game device which in turn can receive it from a memory card device, game media such as a cartridge or compact disk, or a connection to the internet.

16. A system as in claim **14** that allows for the upgrade of the firmware of the controllers by downloading the new firmware from a hardware expansion module or upgrade port physically located on the controller.

17. A system as in claim **13** that allows for the upgrade of the firmware of the controllers by downloading the new firmware from the base transceiver via the RF wireless link and where the firmware upgrade can be made available to the base transceiver via plug in media or by the engaged electronic game device which in turn can receive it from a memory card device, game media such as a cartridge or compact disk, or a connection to the internet.

18. A system as in claim **13** that allows for the upgrade of the firmware of the controllers by downloading the new firmware from a hardware expansion module or upgrade port physically located on the controller.

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CERTIFICATE OF SERVICE AND FILING

I certify that I electronically filed the foregoing document using the Court's CM/ECF filing system on November 21, 2016. All counsel of record were served via CM/ECF on November 21, 2016.

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CERTIFICATE OF COMPLIANCE

The undersigned attorney certifies that Defendant-Cross-Appellant Microsoft Corporation's Opening Brief complies with the type-volume limitation set forth in Fed. R. App. P. 32(a)(7)(B). The relevant portions of the brief, including all footnotes, contain 12,802 words, as determined by Microsoft Word.

Dated: November 21, 2016

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